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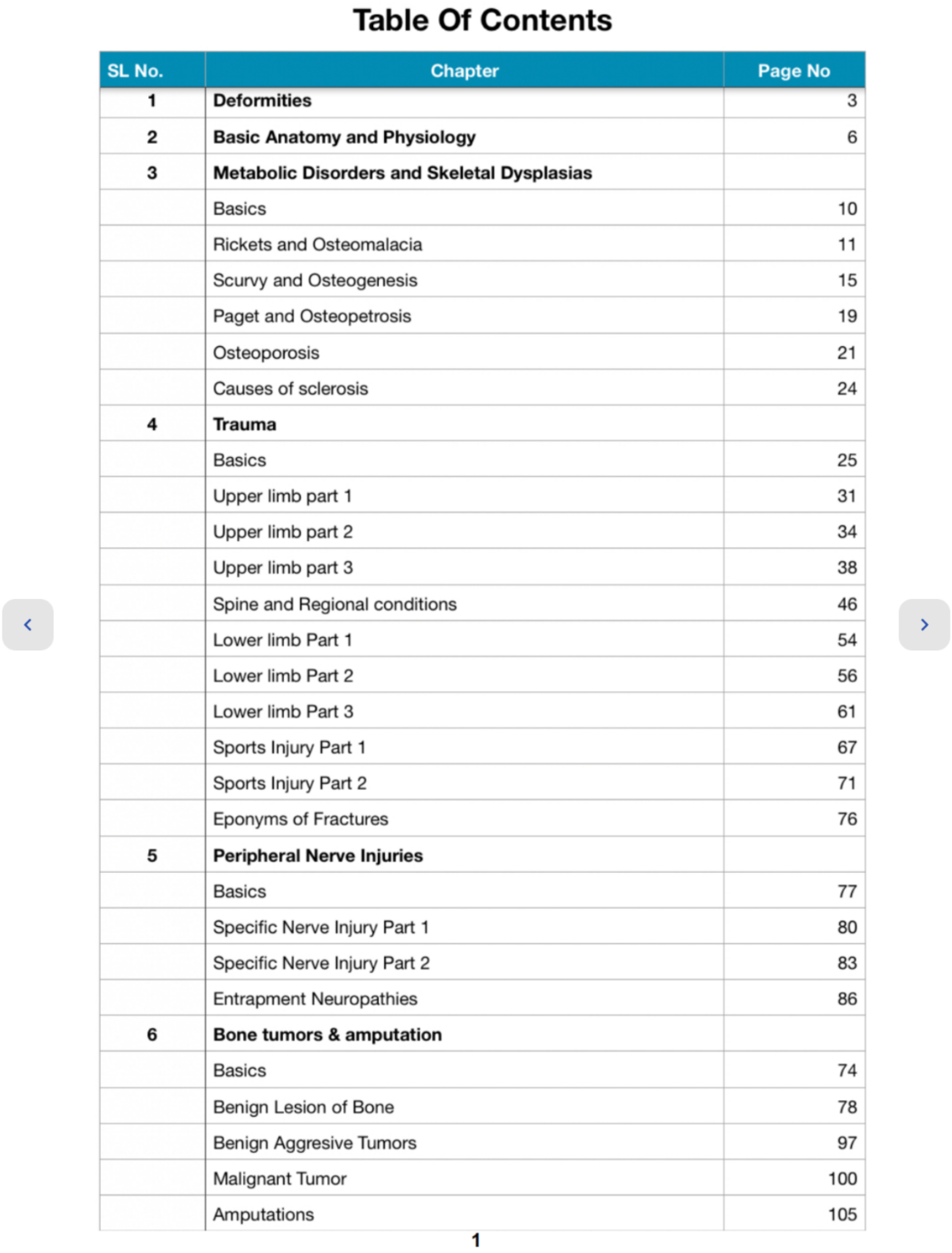

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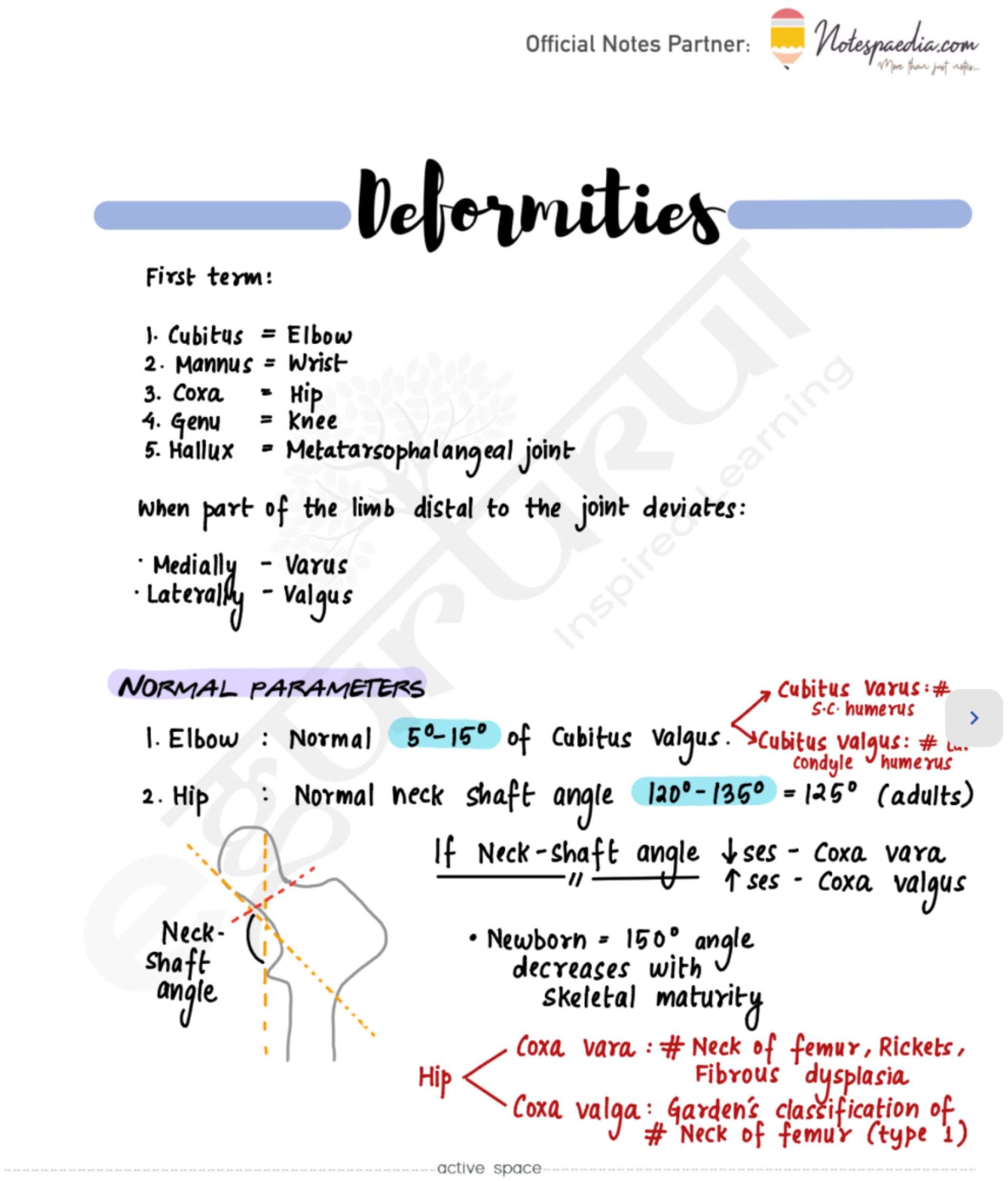

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Deformities

First term:

1. Cubitus = Elbow
2. Mannus = Wrist
3. Coxa = Hip
4. Genu = Knee
5. Hallux = Metatarsophalangeal joint

When part of the limb distal to the joint deviates:

- Medially - Varus
- Laterally - Valgus

NORMAL PARAMETERS

1. Elbow : Normal 5°-15° of Cubitus valgus.
   - Cubitus Varus: # S.C. humerus
   - Cubitus valgus: # condyle humerus
2. Hip : Normal neck shaft angle 120°-135° = 125° (adults)

Neck-Shaft angle

If Neck-Shaft angle ↓ses - Coxa vara
″ ↑ses - Coxa valgus

- Newborn = 150° angle decreases with skeletal maturity

Hip
- Coxa vara : # Neck of femur, Rickets, Fibrous dysplasia
- Coxa valga : Garden's classification of # Neck of femur (type 1)

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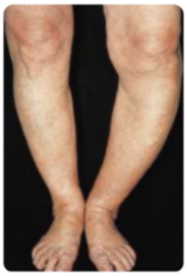
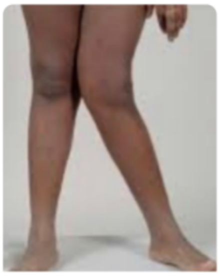
3. Knee : At Birth : Genu Varam = 10°-15°
(Bow legs)
↓
6-12 months : Max. Genu varum
↓
14-22 months : Neutral
↓ ↓
↓ Then starts valgus
↓ ↓
3½ - 4 years : Max Genu valgus (10°-15°)
↓ ↓
7 - 8 years : Reduces → Becomes Normal (6°-8°)
Genu Valgus
(Knock Knees)

Genu varum ⎤→ Physiological
Genu valgum ⎦→ Pathological → Rickets (MC)

- Genu varum : MC deformity associated with Osteoarthritis of kn
(in adults)
: Blount's disease (in children)





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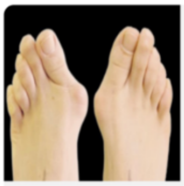

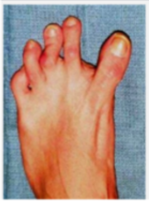

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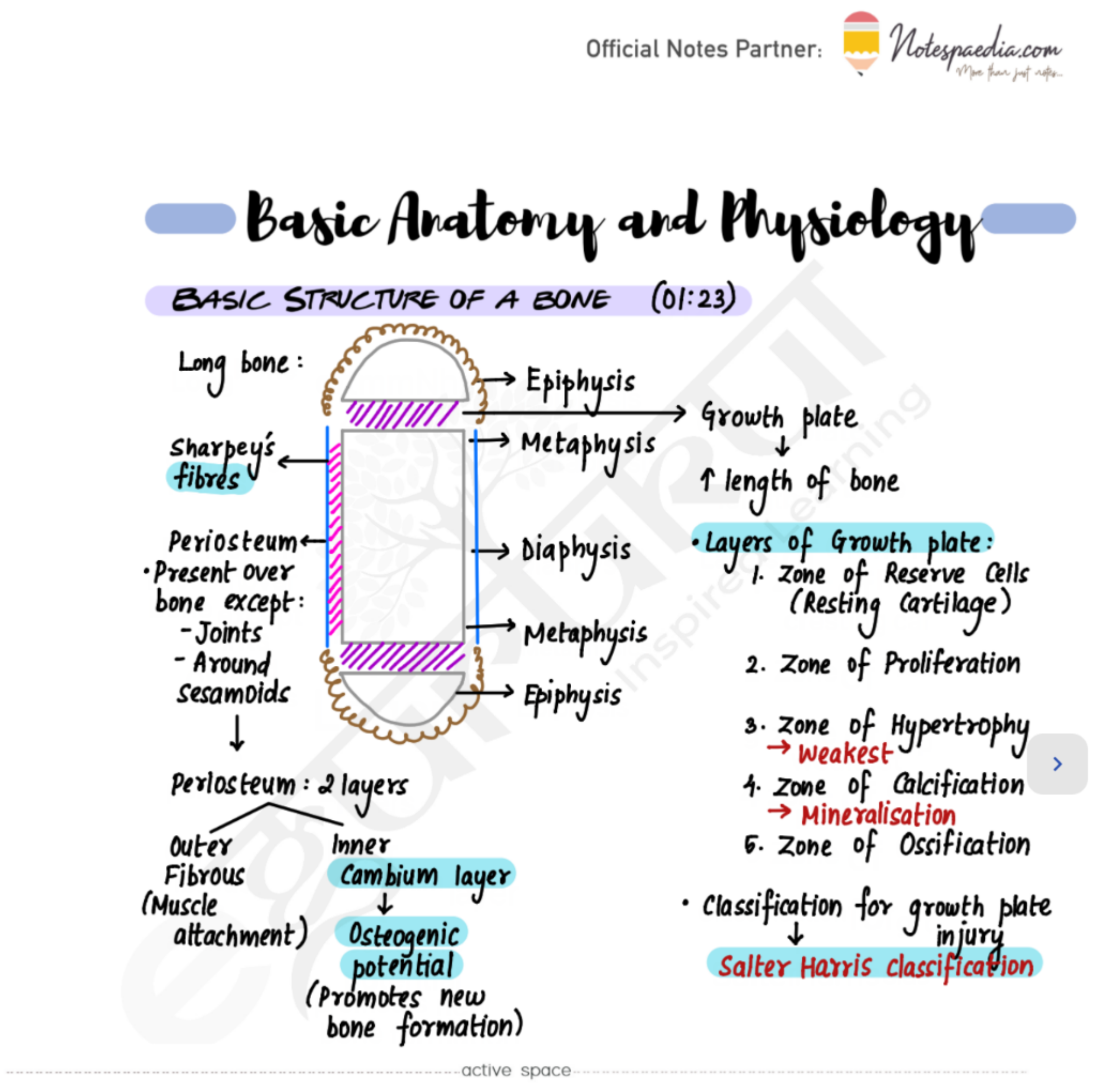

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Basic Anatomy and Physiology

BASIC STRUCTURE OF A BONE (01:23)

Long bone :

Growth plate
↓
↑ length of bone

Sharpey's fibres

Periosteum
- Present over bone except:
  - Joints
  - Around sesamoids

↓

Periosteum : 2 layers

Outer Fibrous (Muscle attachment)

Inner Cambium layer
↓
Osteogenic potential (Promotes new bone formation)

- Layers of Growth plate:
  1. Zone of Reserve Cells (Resting Cartilage)
  2. Zone of Proliferation
  3. Zone of Hypertrophy → weakest
  4. Zone of Calcification → Mineralisation
  5. Zone of Ossification

- Classification for growth plate injury
  ↓
  Salter Harris classification

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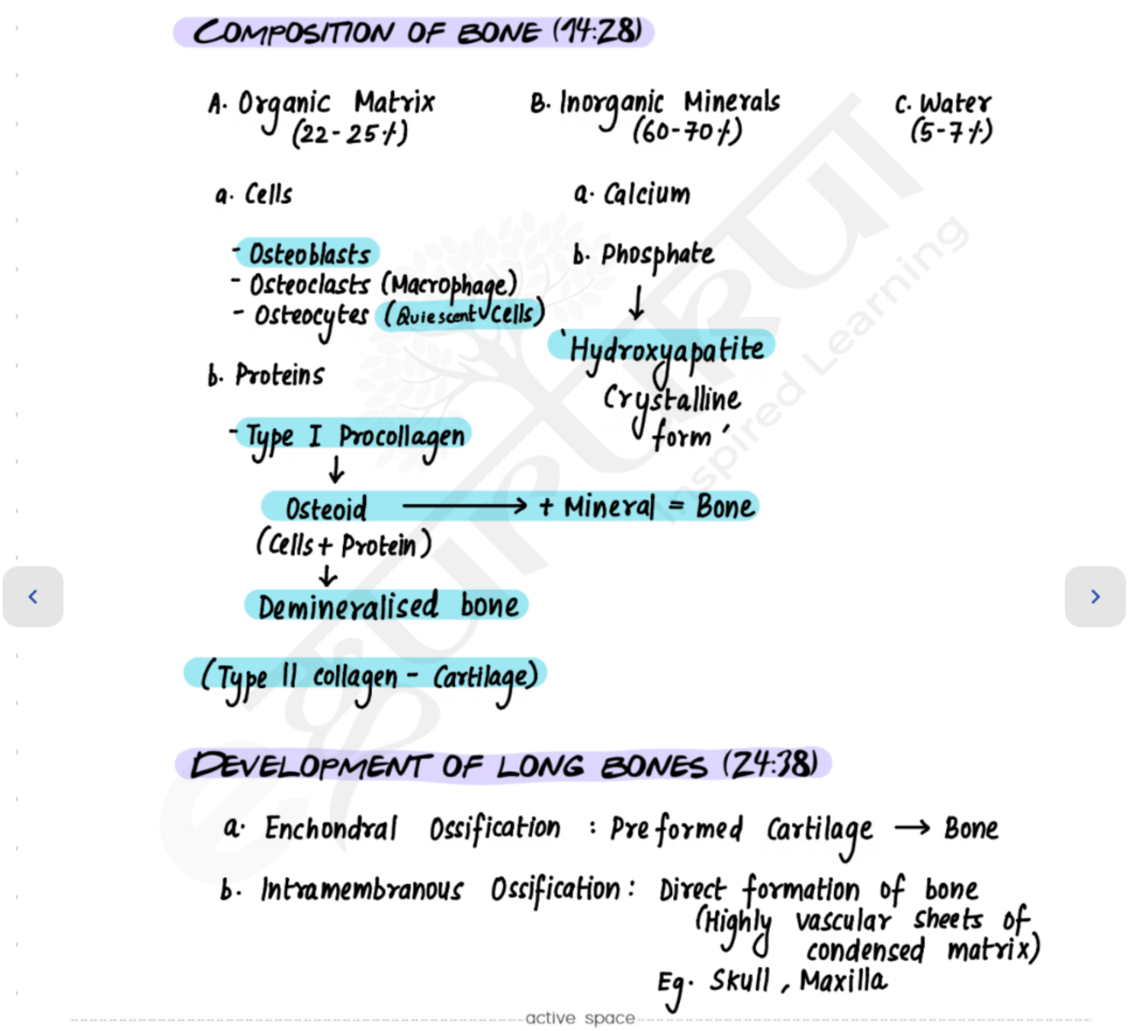

COMPOSITION OF BONE (14:28)

A. Organic Matrix (22-25%)

a. Cells

- Osteoblasts
- Osteoclasts (Macrophage)
- Osteocytes (Quiescent cells)

b. Proteins

- Type I Procollagen

↓

Osteoid ⟶ + Mineral = Bone

(Cells + Protein)

↓

Demineralised bone

(Type II collagen - Cartilage)

B. Inorganic Minerals (60-70%)

a. Calcium

b. Phosphate

↓

'Hydroxyapatite Crystalline form'

C. Water (5-7%)

DEVELOPMENT OF LONG BONES (24:38)

a. Enchondral Ossification : Preformed Cartilage → Bone

b. Intramembranous Ossification : Direct formation of bone (Highly vascular sheets of condensed matrix)

Eg. Skull, Maxilla

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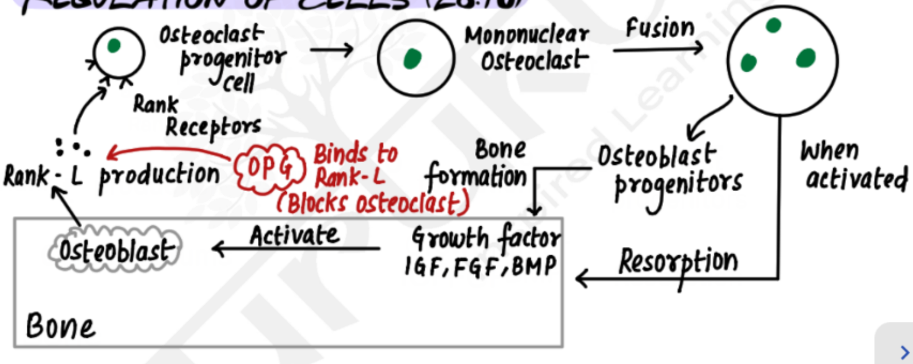
GROWTH OF LONG BONES

a. Appositional growth : ↑ in width of bone → Meta/Diaphysis

b. Interstitial growth : ↑ in length of bone → Epiphysis

REGULATION OF CELLS (28:46)



ASSOCIATED PATHOLOGIES (36:00)

$\underbrace{\text{Cells + Protein}}$ + Mineral = Bone

Cells + Protein ↓ Osteoid ↓ Estimation of Osteoid ↓ **Tetracycline labelling**

Mineral ↓ Calcium, Phosphate, Vit. D } **Serum evaluation**

CELL MARKERS (39:07)

I. Bone Formation Markers

1. Bone specific Alkaline Phosphatase
2. Procollagen type 1C and 1N
3. Osteocalcin (protein)

II. Bone Resorption Markers

1. N and C chains of Telopeptides
2. Deoxypyridinoline
3. Hydroxy proline and Hydroxylysine
4. TRAP - Tartarate Resistant Acid Phosphatase

REGULATION OF CALCIUM AND PHOSPHATE METABOLISM (44:13)

A. PTH → Parathyroid Hormone

1. Intestine : No direct effect
2. Kidney : ↑ conversion of Vit. D (to active form)
3. Bone : Resorption (Net : Ca ↑, PO_4 ↓)

B. Vit. D_3

1. Kidney : ↑ Ca absorption, ↓ PO_4
2. Intestine : ↑ absorption
3. Bone : Net : Ca ↑, PO_4 ↑)

C. Calcitonin → Bone resorption inhibition (Ca↓)

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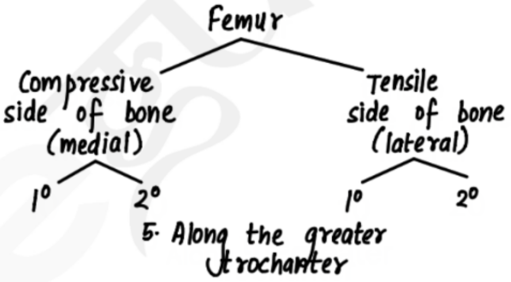
Basics of Metabolic Disorders and Skeletal Dysplasias

COMPOSITION OF BONE (02:18)

a. Cells : (i) Paget's disease (ii) Osteopetrosis (iii) Brown's tumour
b. Protein : (i) Osteogenesis imperfecta (ii) Scurvy
c. Mineral : (i) Rickets (ii) Osteomalacia
d. Combination disorder : Osteoporosis

TRABECULAE (06:15)

These are composed of dense collagenous tissue which are now present in Cancellous bones.


Femur
Compressive side of bone (medial)
Tensile side of bone (lateral)
1°
2°
1°
2°
5. Along the greater trochanter

- Healthy bone : All 5 groups visible on x-ray.
- Lumbar vertebrae : MC affected in Osteoporosis
  Neck of femur # : ―――― // ――――

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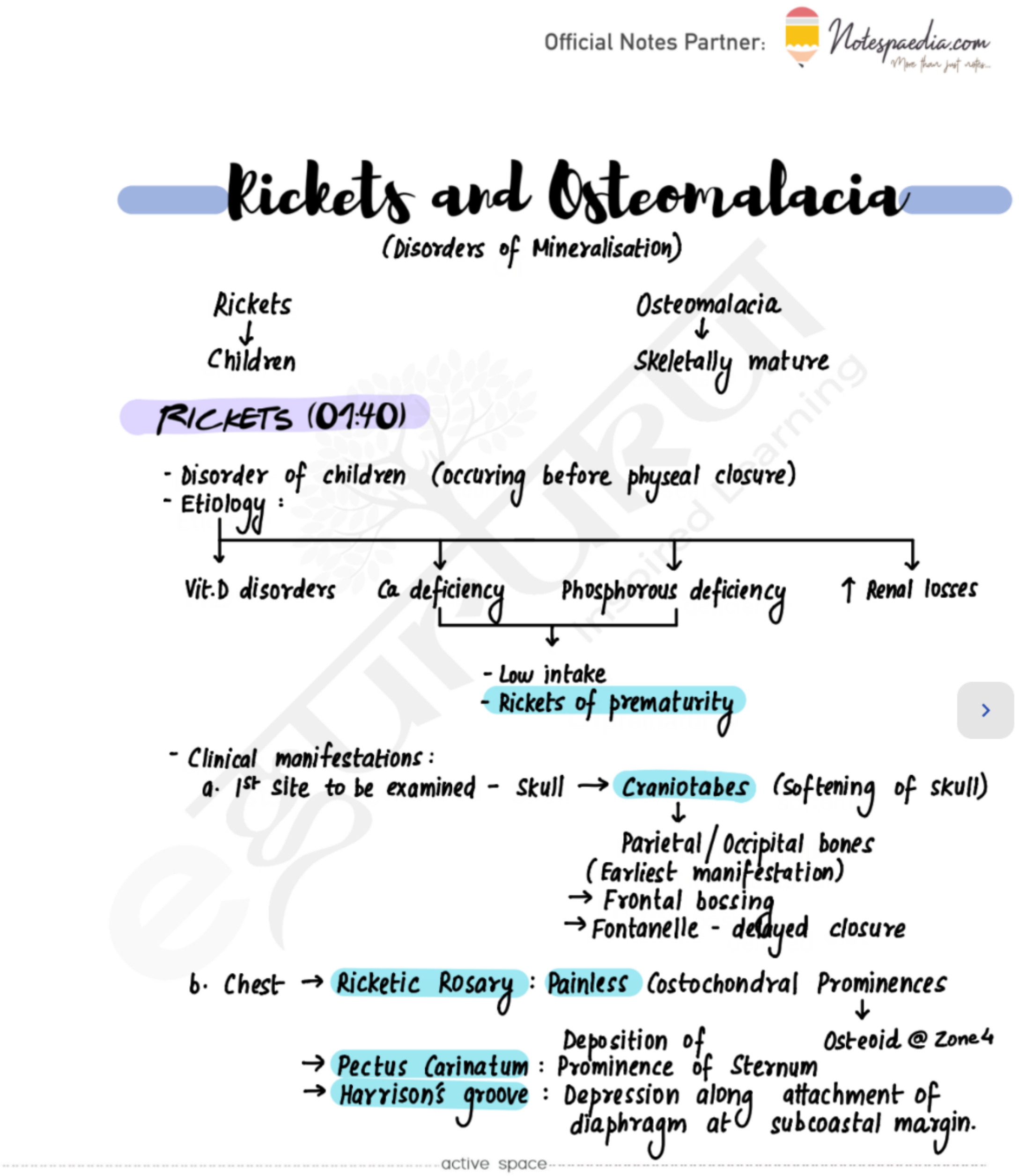

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Rickets and Osteomalacia

(Disorders of Mineralisation)

Rickets ↓ Children

Osteomalacia ↓ Skeletally mature

RICKETS (01:40)

- Disorder of children (occuring before physeal closure)
- Etiology:
  - Vit.D disorders
  - Ca deficiency
  - Phosphorous deficiency
  - ↑ Renal losses

Ca deficiency / Phosphorous deficiency ↓
- Low intake
- Rickets of prematurity

- Clinical manifestations:

a. 1st site to be examined - Skull → Craniotabes (Softening of skull)
↓
Parietal / Occipital bones
(Earliest manifestation)
→ Frontal bossing
→ Fontanelle - delayed closure

b. Chest → Ricketic Rosary : Painless Costochondral Prominences
↓
Deposition of Osteoid @ Zone 4
→ Pectus Carinatum : Prominence of Sternum
→ Harrison's groove : Depression along attachment of diaphragm at subcoastal margin.

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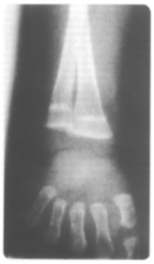
c. Shorteing (Short stature) : Long bones
↓
- a. Diaphysis - Bowing
- b. Metaphysis - Splaying and Fraying
  - Splaying ↓ widening
  - Fraying ↓ Irregular
- c. Knee -
  - i) Genu varum
  - ii) Genu valgum
  - iii) Windswept of legs
- d. Hip - Coxa vara

d. Muscular flaccidity/Muscle weakness/ Tetany / Protruberant abdomen

- Evaluation of the patient:

i) Serum Ca/Ph/Vit.D → ↓sed
ii) S. alkaline phosphatase → ↑sed



- Treatment

Supplement Ca/Ph./Vit.D

- Monitoring of response

i) Radiological monitoring - Appearence of white line around metaphysis on x-ray
↓
Can be seen within 1- 1½ months

ii) Metabolic assessment - Level of alkaline phosphatase

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Initially, level of Alk. Phosphatase - High

↓

When minerals are supplemented, there is gradual decline in Alk. Phosphatase

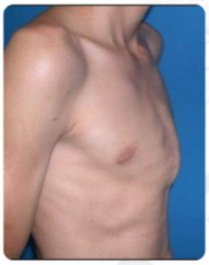
↓

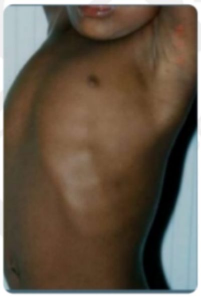
As bone becomes healthy, level of Alk. PO_4 → Normal (In 1-2 years)

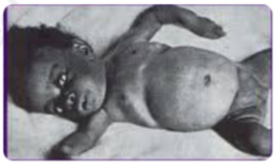
- To check if it is safe to operate on a child with Rickets

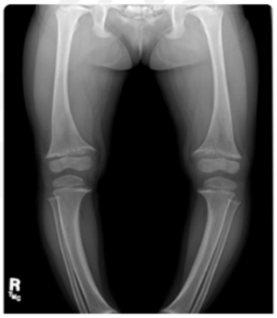
↓

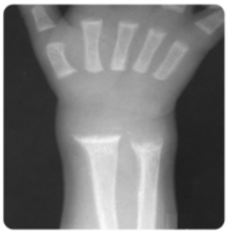
Alk. Phosphatase level should be normal

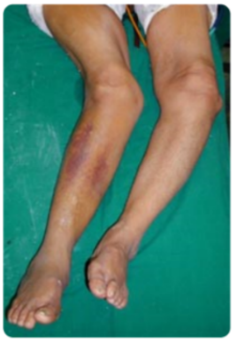












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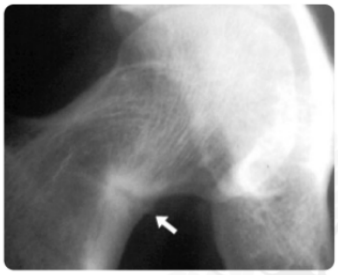
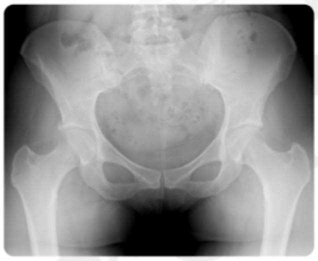
OSTEOMALACIA (28:42)



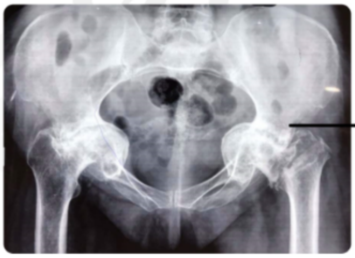
Osteomalacia - Softening of bones

Presentation - H/o minimal trauma leading to pain

Fracture line surrounded by sclerosis
↓
Pseudofractures / Milkman's line / Looser's zone



Sites :
- Pubic rami
- Neck of femur (due to pulsations of femoral artery)
- Olecranon
- Lateral margin of Scapula
- Ribs



→ Protrusio Acetabuli or Otto Pelvis

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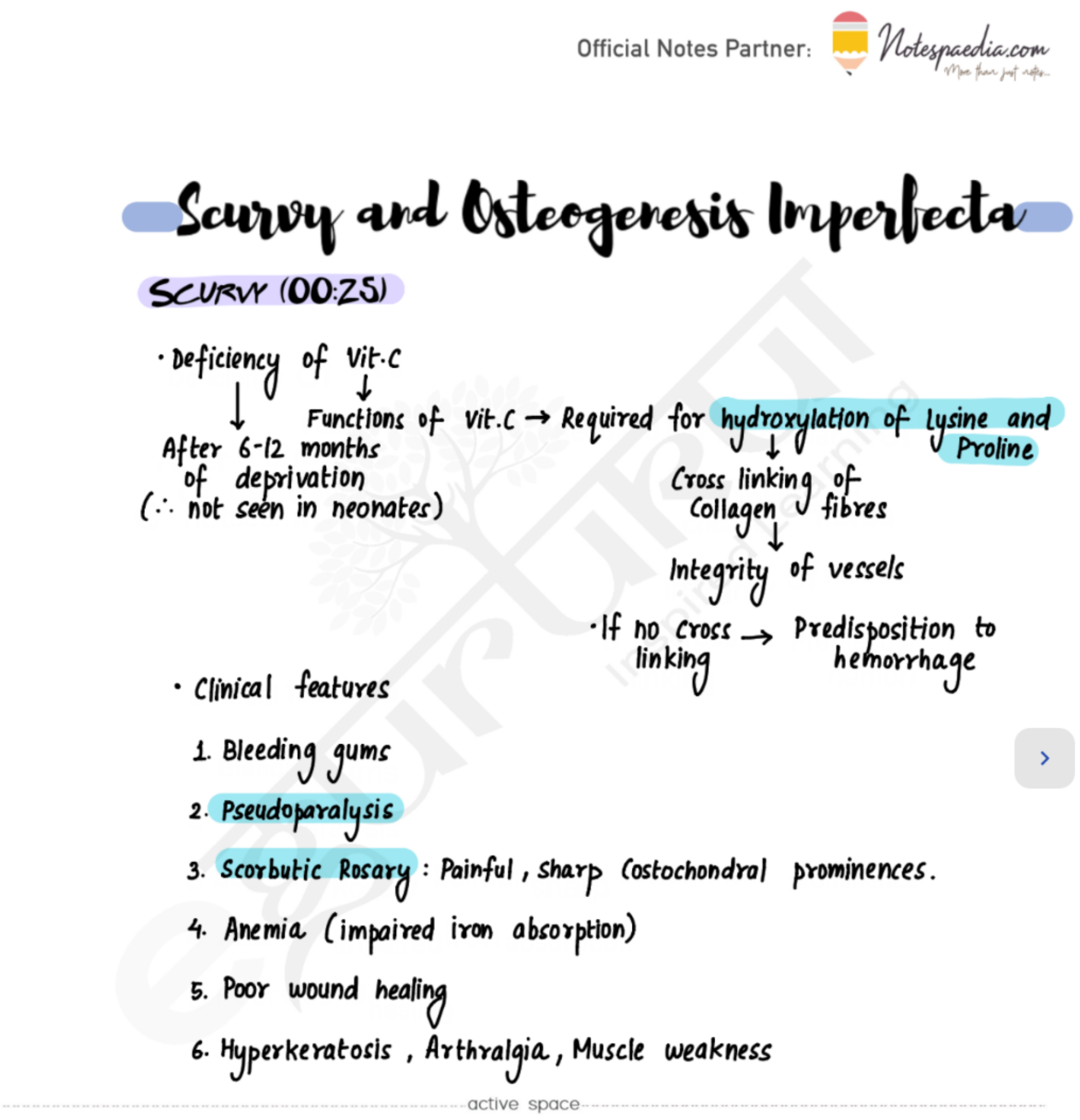

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Scurvy and Osteogenesis Imperfecta

SCURVY (00:25)

- Deficiency of Vit.C
  - ↓ After 6-12 months of deprivation (∴ not seen in neonates)
  - ↓ Functions of Vit.C → Required for **hydroxylation of Lysine and Proline**

↓ Cross linking of Collagen fibres

↓ Integrity of vessels

- If no cross linking → Predisposition to hemorrhage

- Clinical features
  1. Bleeding gums
  2. **Pseudoparalysis**
  3. **Scorbutic Rosary** : Painful, sharp Costochondral prominences.
  4. Anemia (impaired iron absorption)
  5. Poor wound healing
  6. Hyperkeratosis, Arthralgia, Muscle weakness

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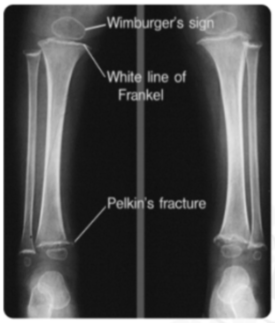
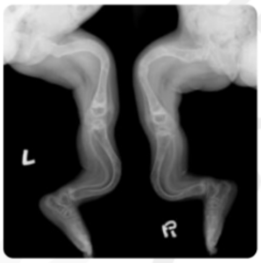


X-ray features :

1. Osteopenia : Ground glass appearence
2. Pencil tip Cortex
3. Wimburger sign
4. White line of Frankel - due to failure of resorption of calcified matrix.
5. Pelican Spur (Projection in metaphysis)

- Treatment : Vit.C supplement.

OSTEOGENESIS IMPERFECTA (13:22)



- Skeletal dysplasia (Hypoplasia)
- Characterised by genetic defect in Type 1 Collagen.
  - Quantitative
  - Qualitative
- AD/AR inheritence
- Clinical features :
  - a. ↑ tendency for #s, Rate of # healing - Normal
  - b. Lower limp # more common (Femur >)
  - c. Growth arrest may be associated due to repeated #.

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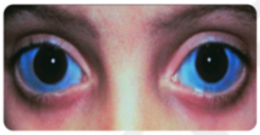
d. Hyperlaxity of ligaments with Hypermobility of joints.

e. Associated problems :

- Malunion / deformity
- OTTO Pelvic
- Dislocations of patella, radial head (although rare)

- When the disease is severe, skull is soft and membranous.
  Death is due to Intracranial hemorrhage or Respiratory insufficiency.



f. Ocular involvement : Blue Sclera
Saturn's Ring or
Arcus Juvenalis.
Retinal detachment
Hyperopia

g. Auditory involvement : Seen in 40-50% cases
(Compression of nerve due to soft skull bones)

- Investigations : S. Ca and S. Ph → Normal
  Alk. PO4 → ↑sed

Diagnosis : i) Positive family history / Clinical / Radiological sign
ii) Electrophoresis analysis of Collagen Type-I
Specimen - Fibroblast cultured from skin biopsy.
iii) Prenatal USG - Multiple fractures

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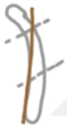
- Treatment : Seekh Kebab Osteotomy
  or
  Soefield Millar Procedure



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Paget's Disease and Osteopetrosis

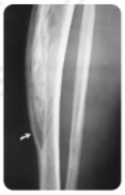
PAGET'S DISEASE (00:01)

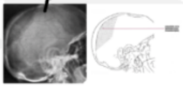
- ↑ functional activity of Osteoclasts.
- Usually seen after viral infections.
- More common in males after 50 years of age.
- MC involved - Pelvis / Tibia

- ↑ Osteoclastic activity → ↑ marker of bone resorption
  ↓
  ↑ Osteoblastic activity → ↑ marker of bone formation

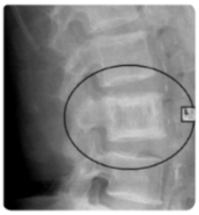
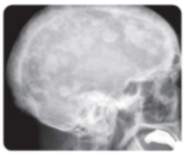
- Phases :

i) Lytic phase :
  a. Blade of grass appearence / Candle flame appearence
  b. Osteoporosis Circumscripta





ii) Mixed phase :
  a. Picture frame / Ivory vertebra
  b. Cotton wool skull

iii) Complications
  a. Pathological # : Banana #
  b. Cranial Nerve palsies : II, V, VII, VIII
  c. Osteosarcoma (<1%)
  d. Steal syndrome
  e. Cardiac failure (high output)
  [Rare complication]

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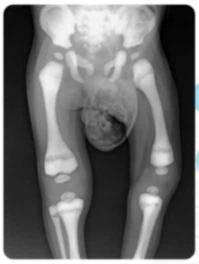
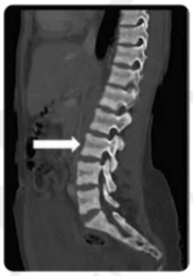
- Treatment : Bisphosphonates , Calcitonin

OSTEOPETROSIS (08:24)



Sclerosis

Erlenmeyer Flask Deformity



Rugger Jersey Spine

- AD/AR inheritence
- ↓ functional activity of osteoclasts. (Qualitative defect)
- Osteoblasts ⟶ Intra-medullary region
  ↓
  2° Hematopoiesis ⟵ Anemia/Pancytopenia
  ↓
  Hepatosplenomegaly
- S. min : Normal
- Both bone (resorption and formation) markers are raised.
- Treatment : BM transplant
  γ- IFN, etc.

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Osteoporosis

- In Osteoporosis, all the constituents are decreased in a proportionate manner.
- T score falls below 2.5 SD of the mean for healthy young adult of same sex.
- Etiology : → Age related
  - → Post menopausal
  - → Others : Lifestyle → Alcohol
    - Smoking
    - High salt intake
    - Low Ca intake
    - Bed ridden
  - : Hypogonadal states
  - : GI disorders
  - : Endocrine disorders
  - : Drugs : Anti epileptics
    - Steroids
    - Methotrexate
    - Antacids (Aluminium)

Inspired Learning

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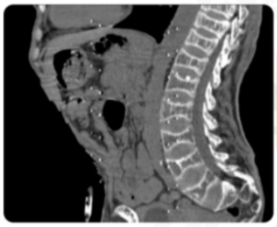
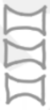
- Clinical features : Pain
- Common sites : Vertebrae
  Neck of femur
  Distal radius } Colles' #
- Investigations : i) S. minerals → Normal

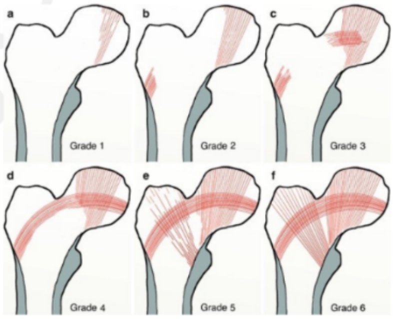




ii) X-ray →
- Compression Vertebral # (Impacted #)
- ← Cod-fish spine appearence
- Dowager's hump
- Singh index

- Gold standard for diagnosis - T Score
  ↓
  DEXA Scan
  (Dual Energ
  X-ray
  Absorptiometry)

- Better than -1 = Normal
- -1 to -2.5 = Osteopenia
- Below -2.5 = Osteoporosis



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- Treatment :

A. Drugs which inhibit resorption:

    a. Bisphosphonates → Alandronate
    Risedronate
    Palmidronate
    Ibandronate
    Zolendronic Acid → Given once in a year

    b. Calcitonin
    c. Estrogen
    d. SERM

B. Drugs which promote bone formation

    a. Calcium
    b. Teriparatide : Synthetic analogue of PTH
    c. Calcitonin

C. Dual action → Strontium Ranelate

D. Denosumab → Blocks Rank ligands.

E. Romosuzumab
Abaloparatide } Newer drugs for Osteoporosis

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Causes of Sclerosis

CHILDREN

1. Caffey's disease
   (Congenital Cortical Hyperostosis)
   Self limiting.
2. Osteopetrosis
3. Lead Poisoning
4. Flouride
5. Hypervitaminosis D & A.
6. Renal Osteodystrophy
   ↓

Rugger Jersey spine
↓
Sclerosis adjacent to end plates.

- Renal Osteodystrophy
- Osteopetrosis
- Brown's tumour

ADULTS

1. Avascular Necrosis
2. Paget's disease
3. Myelosclerosis
4. Fluorosis
5. Osteoblastic metastasis
6. Renal Osteodystrophy
7. Idiopathic

OTHER NAMES:

- Paget's disease : Osteitis deformans
- Osteopetrosis : Marble bone disease / Albers Schonberg disease
- Osteogenesis Imperfecta + Osteopetrosis } Brittle Bone disease

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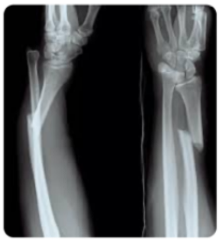
Basics of Trauma General - 1

FRACTURE (01:05)

Break in continuity of cortex of bone:

- Modes of #:
  - Trauma
    - Direct → Transverse #
    - Indirect → Any # pattern
  - Pathological # → MC cause : Osteoporosis
- Types of #: → Open # vs. Close #
  - Open # → # hematoma can come out of wound (communicates with external environment)



- Fracture healing → Stages of # healing:
  - i. Stage of hematoma
  - ii Stage of inflammation & granulation
  - iii Stage of soft callus (woven bone) – 1st stage of clinical # healing
  - iv. Stage of calcification (hard callus / Lamellar bone)
  - v. Stage of remodelling

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- Factors affecting # healing:
    - Age (Young > Elderly)
    - Nutritional status
    - Associated diseases - Anemia
      Diabetes
    - Intake of alcohol / smoking
    - Type of bone (cancellous > cortex)
    - Associated radiation exposure
    - High grade injuries - delayed healing

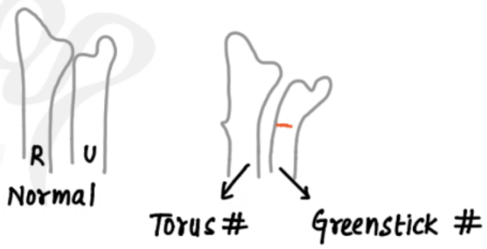
- Most consistent sign of a # → Tenderness

Most pathognomic sign of a # → Abnormal mobility at # site
or
Bony crepitus

- Fractures in Children:

    a. Greenstick #: Incomplete transverse # in child, where periosteum is intact.

    b. Torus #: Buckling of cortex



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c. Classification for growth plate injuries :

"Salter - Harris Classification"

Type I → S → Same level → Physis only

Type II → A → Above level → Physis + Metaphysis } Thurston Holland injury / fragment

↓

"Usually managed conservatively"

Type III → L → Lower level → Physis + Epiphysis

Type IV → T → Total / Thorough → Epi. + Physis + Meta.

↓

"Anatomical reduction and fixation is advised"

Type V → ER → Eraser / Crush → Physis only

↓

"Worst outcome" → Growth arrest

Type VI → Perichondrial Ring injury

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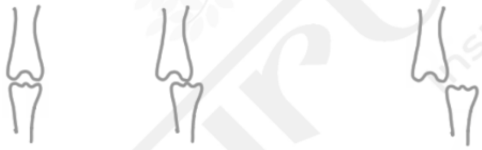
Basics of Trauma General - 2

SPRAIN VERSUS STRAIN (00:25)

- Sprain : Injury to ligament

  Strain : Injury to muscle

SUBLUXATION VERSUS DISLOCATION (01:54)



CLASSIFICATION OF OPEN FRACTURES (03:04)

"**Gustilo - Anderson Classification**"

Type I - Clean wound ; <1 cm

Type II - Wound > 1 cm ; But without extensive soft tissue damage

Type III - Extensive soft tissue damage
- a. Segmental or Communited #
- b. Contaminated Injury ; Periosteal stripping, bone exposure
- c. Vascular injury which needs surgical repair

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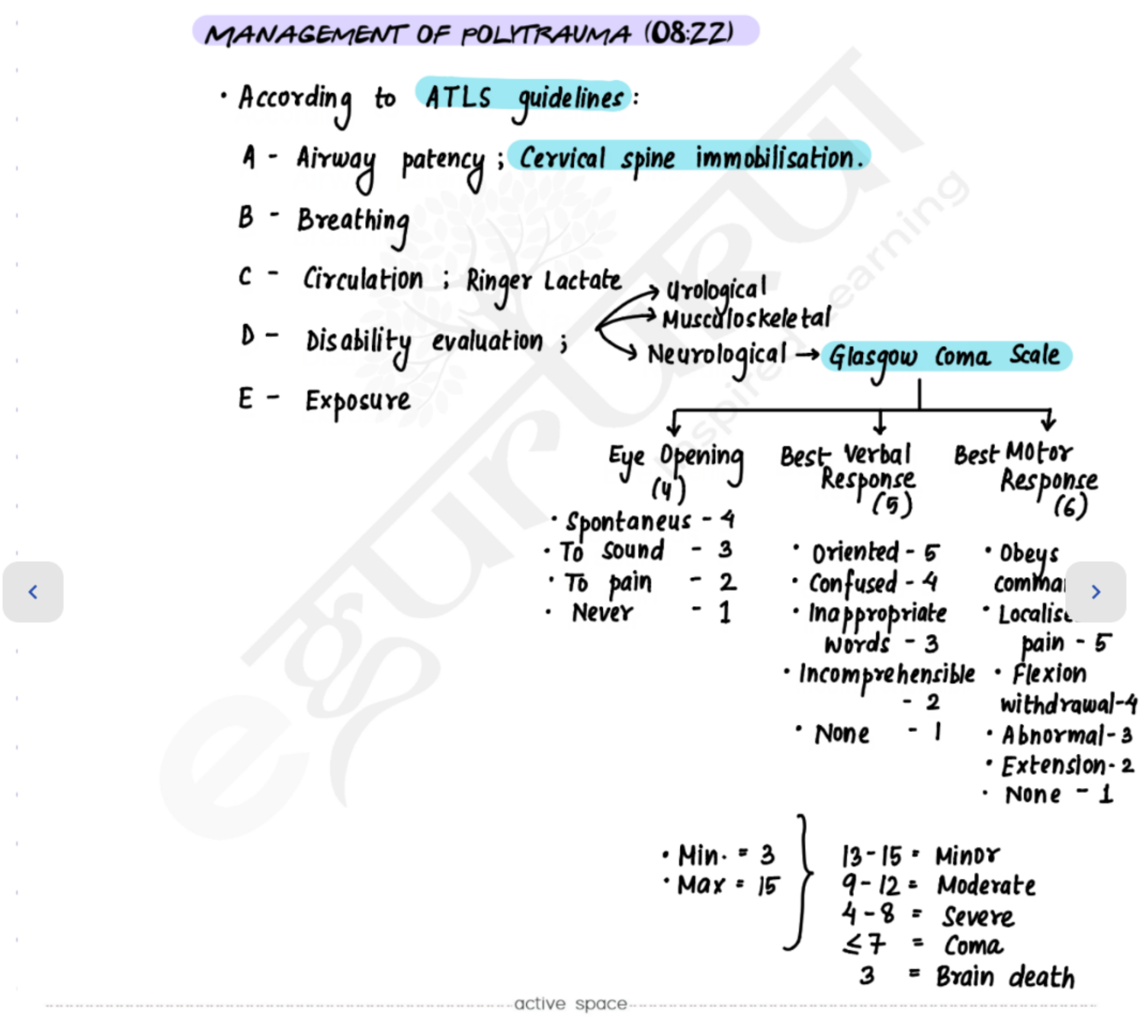

MANAGEMENT OF POLYTRAUMA (08:22)

- According to ATLS guidelines:
  - A - Airway patency ; Cervical spine immobilisation.
  - B - Breathing
  - C - Circulation ; Ringer Lactate
  - D - Disability evaluation ;
    - → Urological
    - → Musculoskeletal
    - → Neurological → Glasgow Coma Scale
  - E - Exposure

Glasgow Coma Scale

Eye Opening (4)

- Spontaneus - 4
- To sound - 3
- To pain - 2
- Never - 1

Best Verbal Response (5)

- Oriented - 5
- Confused - 4
- Inappropriate words - 3
- Incomprehensible - 2
- None - 1

Best Motor Response (6)

- Obeys comma
- Localise pain - 5
- Flexion withdrawal-4
- Abnormal-3
- Extension-2
- None - 1

- Min. = 3
- Max = 15

13-15 = Minor
9-12 = Moderate
4-8 = Severe
≤7 = Coma
3 = Brain death

INVESTIGATIONS IN ORTHOPAEDICS (22:50)

a. X- Ray : "Rule of 2"
- 2 views
- 2 joints
- 2 sides
- 2 occasions (2 weeks : Scaphoid #)

b. MRI → IOC for soft tissues
IOC for stress # (Single site /unilateral)
IOC for occult # associated with Avascular Necrosis
↳ Scaphoid /Neck of femur /Talus.

c. CT Scan → Bone #
Calcifications
- Calcaneum → 3D CT Scan

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Upper Limb - 1

ROTATOR CUFF (00:55)

4 muscles - Supraspinatous → MC to get injured : Abduction (0°-15°)
Infraspinatous
Teres minor } External rotation of shoulder
Subscapularis → Internal rotation of shoulder
↓
Lift off test

- Grades of injury and treatment :

Grade I → Tear < 50% articular surface

Grade II → Tear > 50% articular surface

Grade III → Small to medium tear < 3 cm ; 1 tendon involved

Grade IV → Large , massive tear = 3 cm ; Repairable ; 2-3 tendons

Grade V → Large , massive tear = 3 cm ; Not repairable

Grade VI → Retracted massively ; Irrepairable tear ; Intra-articular pathology

Treatment :

Grades I, II, III → Arthroscopic repair ± Acromioplasty
Grade IV → Open / Arthroscopic repair
Grade V → Tendon transfer / Partial repair
Grade VI → Reverse total shoulder arthroplasty

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DISLOCATION OF SHOULDER (09:32)

- MC joint to have recurrent dislocations.

Types: **Anterior**

Attitude: Abduction + Ext. Rotation

Types:
a. Pre-glenoid
b. Sub-coracoid (MC)
c. Infraclavicular

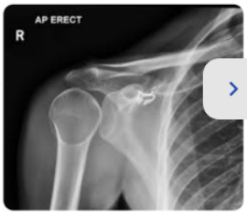
Clinical tests:
a. Duga's test
b. Hamilton ruler test
c. Callway's test

Treatment:
a. Kocher's reduction
b. Hippocratic method
c. Stimpson's Gravity method.

Steps of Kocher's reduction :
TEAM = Traction
Ext. Rotation
Adduction
Medial Rotation

Posterior

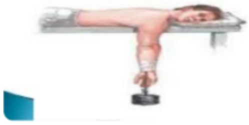
- Adduction + Int. rotation
- More common in:
  - Fall after electric shock
  - Epilepsy
- Contour of shoulder may be normal
- Non specific JERK test.
- X-ray :
  - Electric bulb sign
  - Empty glenoid sign



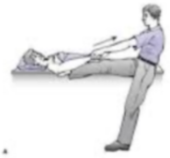
Inferior

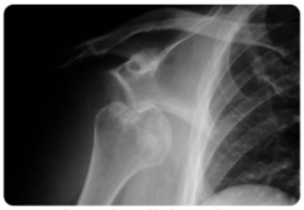
- Hyperabduction.
- 'Salute posture' seen.
- Sulcus sign seen.

STIMPSON'S GRAVITY METHOD



Hippocrates Method





Anterior dislocation

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COMMON POINTS (24:51)

- Complications
  - MC complication : Recurrence
  - MC acute complication : Axillary nerve injury ↓
    - Motor → Deltoid , Teres minor
    - Sensory → Regimental Badge sign

Recurrence

- Ant· dislocation
  - Hill Sach lesion
    Posterolateral aspect of humeral head
  - Bankart lesion
    Ant· margin of glenoid
- Post· dislocation
  - Reverse Hill Sach lesion
    Anteromedial aspect of humeral head
  - McLauglin's lesion.

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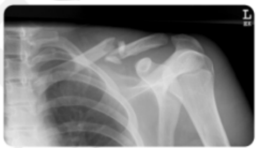
Upper Limb - 2



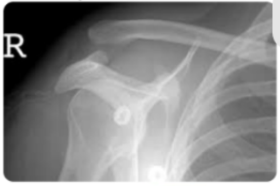
CLAVICLE (00:15)

- MC bone # during delivery.
- MC site of # : Middle 1/3rd (Medial 2/3 - Lateral 1/3)

- Medial fragment gets displaced upwards due to SCM.
- Lateral fragment gets displaced downwards due to gravity and weight of the limb.

- Treatment : Conservative
  - Triangular sling (Better)
  - Figure of 8 bandage

- Complications :
  - Malunion (MC)
  - Injury to subclavian vessels, Brachial plexus
  - Shoulder stiffness

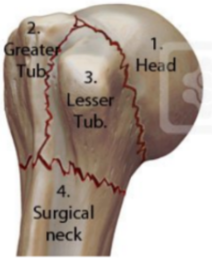


ACROMIO-CLAVICULAR INJURY (06:58)

- due to fall on shoulder
- Treatment :
  - Triangular sling
  - Valpeau bandage

PROXIMAL HUMERUS (08:50)

- 4 parts: Head
  Greater tuberosity
  Lesser —〃—
  Surgical neck



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Classification for Proximal humerus injury - NEER'S classification

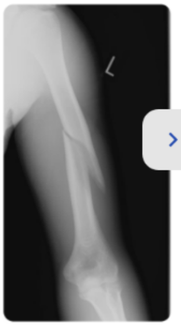
- 1 part #
- 2 part #
- 3 part #
- 4 part #

Majority of #s in proximal humerus managed conservatively till they are displaced.

Displaced # : If displacement > 1 cm or
angulation > 45°

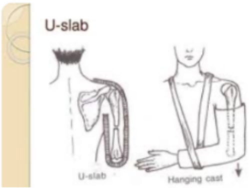
Treatment : Sling support or Shoulder immobilizer.

Complication : Injury to Axillary nerve



SHAFT OF HUMERUS (14:44)

- MC involves : Radial nerve ⟶ Wrist drop.
- MC site of involvement : Distal $1/3^{rd}$ of humerus
- Oblique # of distal $1/3^{rd}$ = Holstein Lewis #
- Management : U-Slab
  Hanging cast



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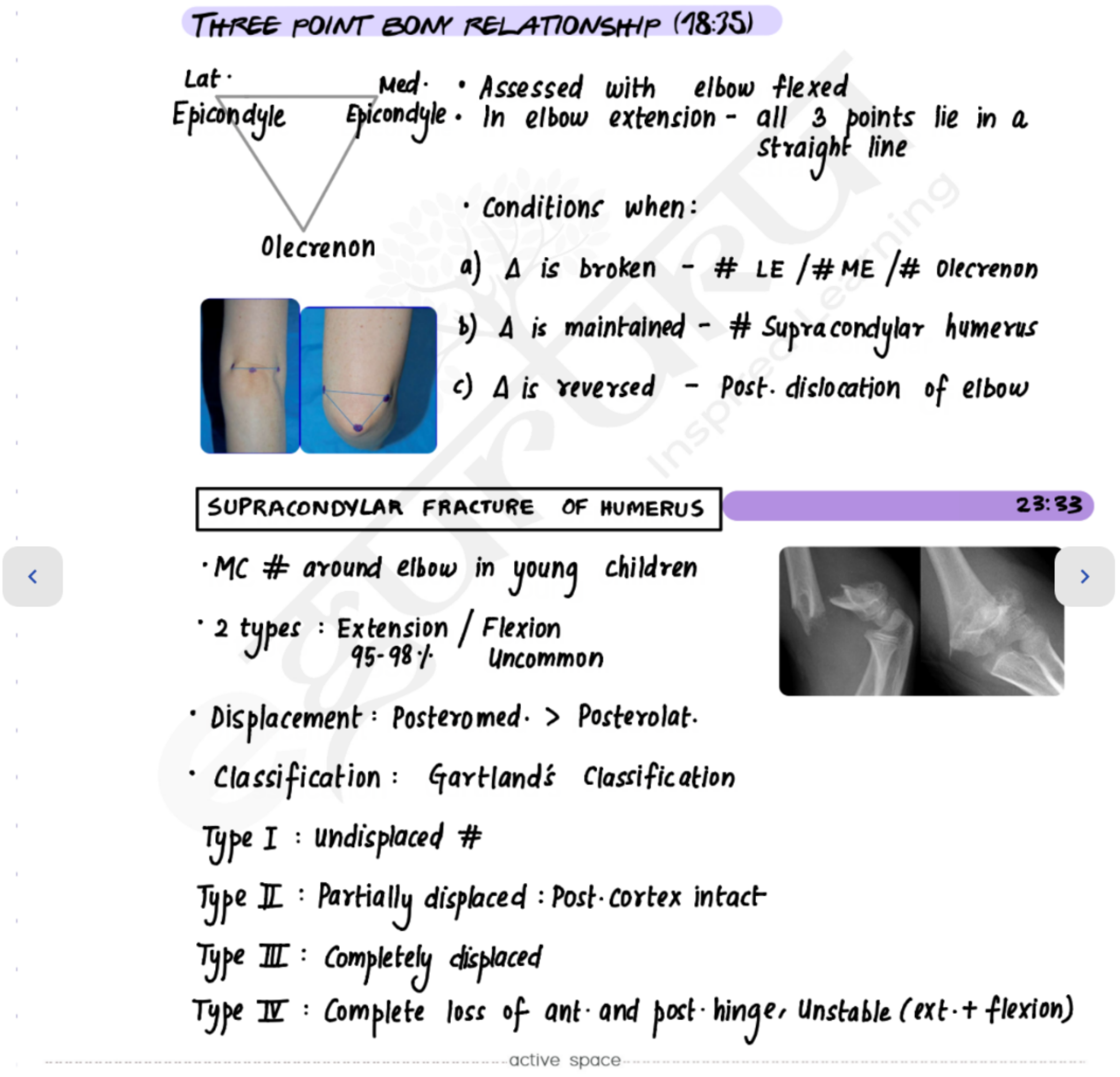

THREE POINT BONY RELATIONSHIP (18:35)

- Assessed with elbow flexed
- In elbow extension - all 3 points lie in a straight line
- Conditions when:

a) Δ is broken - # LE / # ME / # olecrenon

b) Δ is maintained - # Supracondylar humerus

c) Δ is reversed - Post· dislocation of elbow

SUPRACONDYLAR FRACTURE OF HUMERUS

23:33

- MC # around elbow in young children
- 2 types : Extension / Flexion
  - Extension 95-98 %
  - Flexion Uncommon
- Displacement : Posteromed· > Posterolat·
- Classification : Gartland's Classification

Type I : undisplaced #

Type II : Partially displaced : Post· cortex intact

Type III : Completely displaced

Type IV : Complete loss of ant· and post· hinge, Unstable (ext· + flexion)

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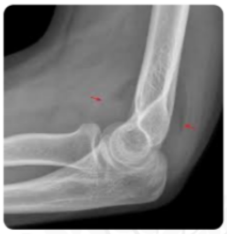
- X-ray :  Ant. and Post. fat pad signs

- Treatment : Undisplaced # → Conservative
  Partially displaced → CRIF K-wires)
  Completely displaced → ORIF

- Complications :

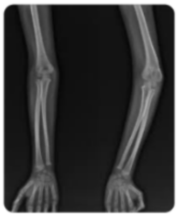
– Immediate / Early

1. Nerve injury - AMRU (Ant. Int. > Median > Radial > Ulnar)

   Medial displacement → Radial n. is at risk.
   Lateral displacement → Median n. and Brachial artery at risk.

2. Vessel → Brachial artery

3. Volkman's Ischaemia → Flexor Digitorum Profundus (MC)



– Late

1. Malunion (MC) → Cubitus varus (Gunstock deformity)
   T/t - French / Modified French Osteotomy
2. VIC - Volkman's Ischaemic Contracture
   T/t - Turn buckle splint / Maxpage Operation
3. Myositis Ossificans

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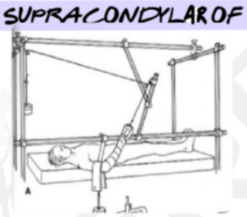
Upper Limb - 3

ADDITIONAL INFO ON # SUPRACONDYLAR OF HUMERUS (00:35)

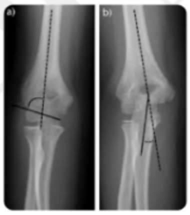
- Dunlop Traction



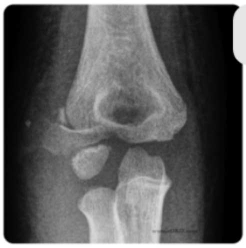
- Baumann's Angle
  (Humeral Capitellar Angle)

  Normal → 64°- 81°

  >82° → Cubitus varus



LATERAL CONDYLE OF HUMERUS # (04:44)



- # of neccesity → # lateral condyle
  # Neck of femur
  # Galeazzi

- Fixation = # Patella (displaced)
  # Olecrenon (displaced)
  # Distal 1/3 of ulna
  # Distal 1/3 of tibia

- # Lat. epicondyle → # of neccesity → Non-union
  ↓
  Tardy ulnar nerve palsy ← Progressive Cubitus valgus

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- Salter Harris Type II > Type IV

Type II ↓ # passes around Capitellum

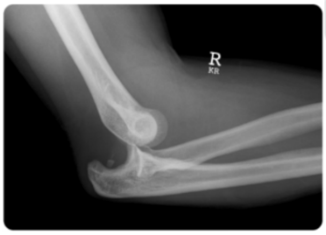
Type IV ↓ # passes through Capitellum.

PULLED ELBOW (17:55)

- Subluxation of radial head from annular ligament
- Age group : 2-5 years
- Attitude - Elbow extended
  Forearm pronated
- Treatment - Elbow flexed
  Forearm is supinated

ELBOW DISLOCATION (18:15)

- Can be ant·/post·/med·/lat·
  post· ↓ MC
- Bowstring sign seen due to triceps.
- 3 point relationship → Reversed



ESSEX LOPRESTI LESION (20:38)

- Injury to Interosseus membrane
- Distal ulna subluxation
- # Radial head

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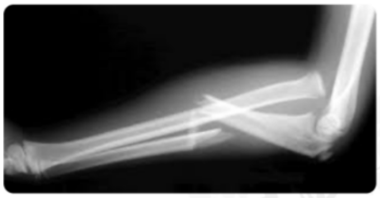
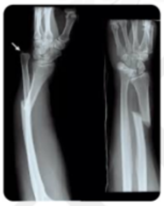
PROXIMAL ULNA # WITH SUBLUXATION OF RADIAL HEAD (22:52)



- # Monteggia
- Commonest nerve involved - Post. Interosseus n.
  ↓
  Finger drop
  (inability to extend the fingers)

GALEAZZI (25:20)

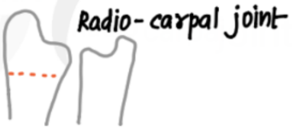


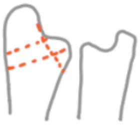
- Reverse Monteggia #
- # distal 1/3 radius
- Dislocation of distal ulna
- # of necesity

DISTAL END OF RADIUS (27:10)

- Colle's Smith Barton Chauffeur

← Extra-articular → ← Intra-articular →





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COLLE'S

SMITH(29:30)

← Distal end of radius →

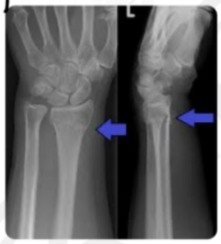
← Extra-articular →

DER at its corticocancellous junction around 2 cm from the distal articular surface with typical displacement.

COLLE'S

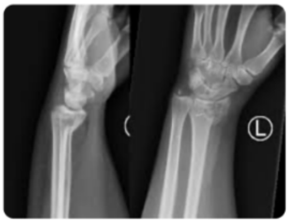
Displacement: LIDS

1. Lateral displacement/tilt
2. Impaction
3. Dorsal displacement/tilt
4. Supination



SMITH

Palmar displacement (of distal fragment)



Complications: Stiffness (MC)

Malunion → Dinner fork deformity

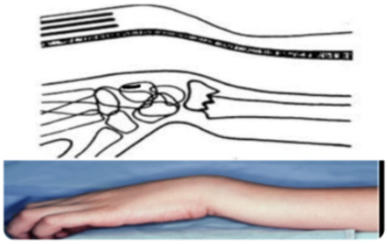
Rupture of EPL tendon

Sudeck's dystrophy

Carpal tunnel syndrome

Carpal instability

Garden Spade deformity



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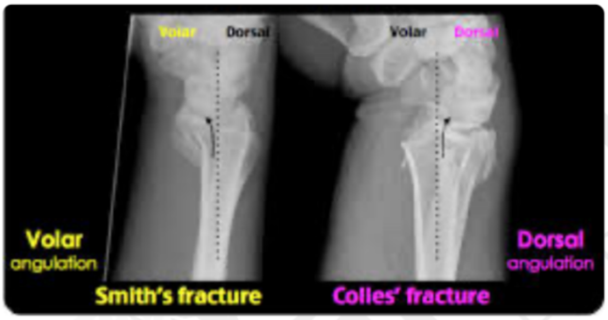

BARTON'S # (38:27)

- Partial intra-articular # of distal radius with subluxation or dislocation of carpals dorsally.
- Types :- Volar - Dorsal

CHAUFFEUR'S # (40:03)

- # of radial styloid only.
- Intra-articular #

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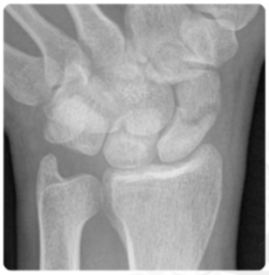
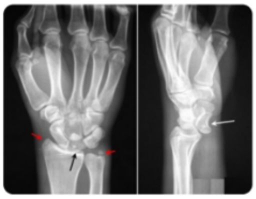
SCAPHOID (40:43)



- MC carpal to get # : Scaphoid > Triquetral
- MC site of # : Waist of Scaphoid
- MC site of AVN : Proximal pole of Scaphoid
  (due to Retrograde supply)
- Clinically, tenderness in anatomical snuff box.
- X-ray : AP/PA/Lat./Oblique views
  - Best : PA > Oblique
  - May not show # upto 2 weeks.
- IOC – MRI
- Treatment - Conservative : Glass holding or Tumbler holding position
- Complication - Non-union (MC)
  AVN
  Carpal tunnel syndrome

LUNATE DISLOCATION (47:37)

- MC carpal to dislocate



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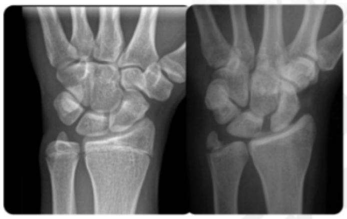
- Lunate dislocation
  Perilunate dislocation → Lunate is in position,
  Rest of carpals are dislocated
- Complication - Carpal tunnel syndrome

TERRY THOMAS SIGN (49:25)

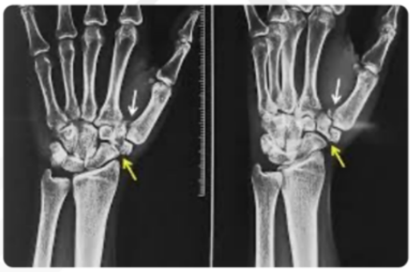


Scapho - lunate dissociation

Significant dislocation >5 mm

Subluxation - 3 mm

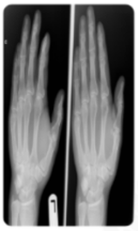
METACARPAL INJURIES (50:42)



- 1st Metacarpal base #:
  - Bennet : Partial Intra-articular #
    Displacement of Bennet → APL tendon
  - Rolando : Communited Intra-articular #
    Y / T shaped

active space

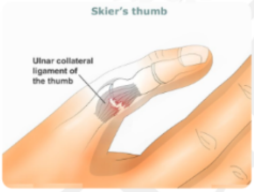
BOXER'S # (52:50)



# of neck of 5th metacarpal

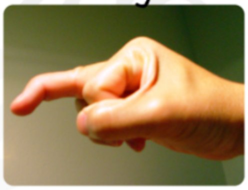
OTHERS (53:20)

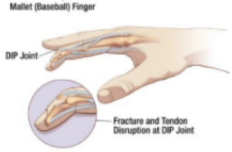
- Skier's Thumb / Gamekeeper's Thumb



Injury to ulnar collateral ligament of thumb.

- Mallet finger - Avulsion of extensor tendon from distal phalanx.





- Jersey finger - Injury to Flexor digitorum profundus.

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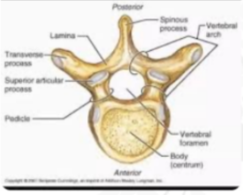
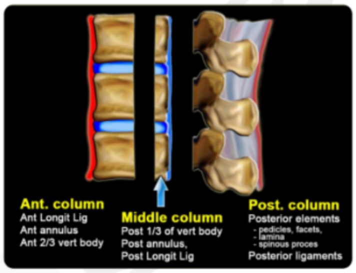
Spine and Regional Conditions

SPINE (00:35)

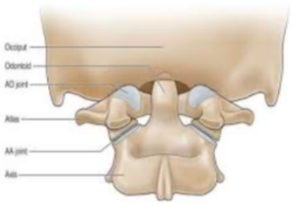
- Parts of vertebra



- Dennis Three Column Concept



- Single column injury → Conservative Management
- Two or Three column injury → Surg

- 

Occiput] Yes movement (Flexion + Extension)
C_1
C_2] No movement (Rotation)

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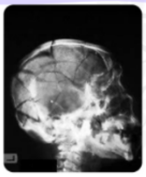
Inspired Learning

SPINAL INJURY (05:50)

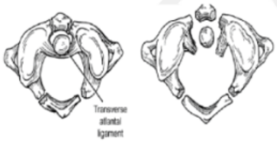
- Reflexes lost in spinal injury. (All Reflexes)
- 1st reflex to revert to normal - **Bulbocavernous Reflex**

MOTORCYCLIST FRACTURE (06:48)



- Hinge # of skull
- Divides skull into 2 halves < Ant. / Post.

JEFFERSON FRACTURE (07:24)

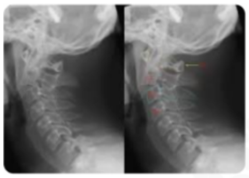


- **MC # of C1 vertebra**
- Caused by axial compression force ± extension
- Spinal cord usually not damaged.
- Neurological deficits usually not associated.
- IOC - CT Scan
- Treatment - Undisplaced stable injury
  → Cervical collar / Halo cast
  → Surgical intervention - min. cases

active space

Inspired Learning

HANGMAN'S FRACTURE (10:44)

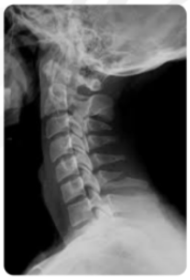


- Spondylolysthesis of C_2 over C_3
- 2nd MC # of C_2 after # Odontoid.
- Mechanism - Extension with distraction
  - Hyper-extension
  - Axial Compression
  - Flexion

WHIPLASH INJURY (18:33)

- Acceleration - Deacceleration injury
- Also known as 'Sprained neck'
- Usually no vertebral involvement but, spinal cord may be involved.

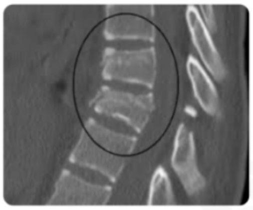
CLAY SHOVELLER'S INJURY (15:35)



- Avulsion of spinous process
- Usually seen at $C_7 > T_1$

active space

CHANCE FRACTURE (17:20)



- Flexion - distraction injury
- On impact → Sudden flexion of Lumbar spine
  ↓
  Bone and ligament fail in tension around center of rotation (created by the seat belt)

  "Jack knife pattern"

- Compression of vertebra along with a # line through all posterior elements of vertebra.

CONSERVATIVES MODALITIES FOR VERTEBRAL INJURY (21:20)

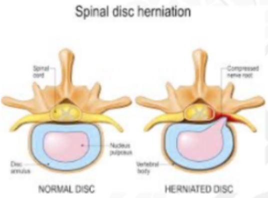
1. Cervical Spine :
   - Halo Cast
   - Crutchfield Tong
2. Cervicodorsal Spine : Minerva Cast
3. Dorsal spine :
   - Taylor's Brace
   - ASHE (Ant. Spinal HyperExtension) Brace

active space

VERTEBROPLASTY (23:38)

- For compressive vertebral #
- Cement used : Poly Methyl Meth Acrylate (PMMA)
  ↓
  MC used cement in orthopaedics

DISC HERNIATION/ PROLAPSE (25:48)


Spinal disc herniation

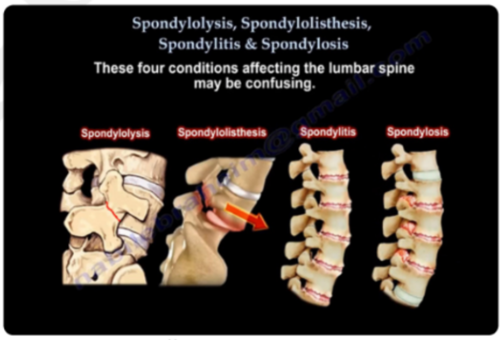
- 3 types : Central (least common)
  Paracentral (MC)
  Lateral
- MC site : $C_5 - C_6$ - Cervical
  $L_5 - S_1 > L_4 > L_5$ - Lumbar
- Central : Cauda equina syndrome
  Paracentral : Travelling root
  Lateral : Exiting root

$L_4 - L_5$
↙ Exiting root
↓ Travelling root
↓
More commonly compressed

	Motor Weakness	Sensory deficit	Reflex Changes
L_4	Quadriceps Hip adductors	Posterolat. thigh Ant. knee Med. side of leg	Patellar tendon
L_5	EHL Gluteus medius EDL and Brevis	Ant lat. leg Dorsum of foot + great toe	

active space

- Investigations : 1. X-ray
  2. MRI - IOC
  3. Myelography
- Treatment : 1. Conservative
  2. Surgical →
    - Epidural injections
    - Fenestration
    - Laminotomy
    - Laminectomy
- Spondylolysthesis : Slip of one vertebra over another
- Spondylolysis : Break at Pars Interarticularis
- Spondylosis : Degenerative Change
- Spondylytis : Inflammatory Change



Spondylolysis, Spondylolisthesis,
Spondylitis & Spondylosis

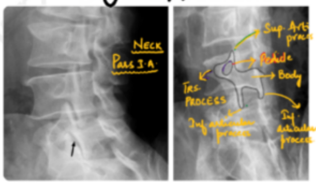
These four conditions affecting the lumbar spine may be confusing.

active space

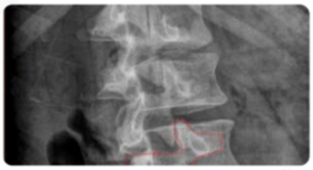
SPONDYLOLYSTHESIS (40:12)

- MC level : L_4-L_5 > L_5-S_1
- Causes : Dysplastic
  Isthmic → Pars I.A. → L_5-S_1
  Degenerative (MC) → L_4-L_5
  Post traumatic (Eg. Hangman's #)
  Pathological (Eg. Aneurysmal Bone Cyst)
- Presentation - Pain ± Radiculopathy

(N) Oblique X-ray Lumbar spine - Scottish Dog appearence



- Spondylolysis best seen in Oblique view
  ↓
  Breach in neck of dog
  ↓
  Collar around neck
  ↓
  Scottish Dog / Terrier Sign
-



Spondylolysthesis - Best view - lateral
- AP view - Inverted Napolean hat sign

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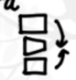
SCOLIOSIS (48:25)

- Lateral bending with rotation of vertebra.

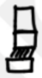
Congenital

a. Failure of formation
Eg. Wedge vertebra



Hemivertebra

b. Failure of segmentation
- Block vertebrae

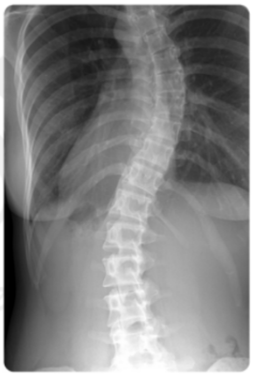


Idiopathic (MC)

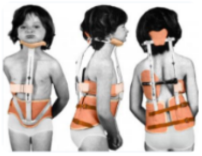
a. Infantile
<3 years age

b. Juvenile
<10 years

c. Adolescent (MC)
>10 years



- Scoliosis defined by convexity of spine.
- Postural Scoliosis v/s Pathological Scoliosis.
↓
Disappears on forward flexion
- Angle seen → Cobb's angle
- Treatment :
  - Conservative
    - Milwaukee Brace (Children)
    - Riser's Cast (Adults)
  - Surgery : Ant or Post spinal fusion



- **Kyphosis** - Forward curvature of spine

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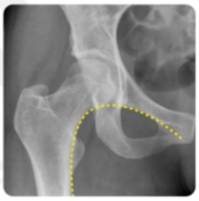
Lower Limb - 1

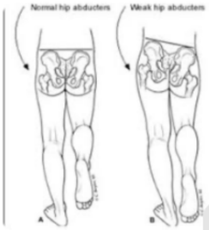
BASICS (00:40)

1. Shenton's Arc



- Made by joining medial cortex of femoral neck and lower border of sup. pubic rami.
- Broken in : # NOF, Dislocation of femoral head, AVN

2. Trendelenberg's test



- Done to assess the integrity of abductors Gluteus medius and gluteus minimus (supplied by Sup. gluteal nerve)
- Mechanical reasons :
  - a. NOF : # NOF, Coxa vara (Lever)
  - b. Joint : Dislocation, AVN, # Acetabulum

PELVIC INJURIES (09:10)

- Max. blood loss : 1.5-2 L
- Classification used : TILE'S
- Injury patterns :
  - i. Straddle # : # of B/L both pubic rami
  - ii. Open book injury : Ant-Post compression injury
    Rotationally unstable
    Vertically stable
  - iii. Malgaigne # : Disruption of pubic symphysis with # Ilium near Sacro-Iliac joint.
  - iv. Bucket handle injury : Lateral Compression injury
    vertically stable ; Injury to SI Joint and opp. p.r.

active space

v. **Jumper's #** :
- Forceful axial loading of spine and pelvis.
- leads to dissociation of sacrum from lateral portion.

vi. **Crescent #** :
- Vertically stable , Rotationally unstable
  - Vertically stable ↓ Post. S.I. joint is intact
  - Rotationally unstable ↓ due to disruption of Iliac wing

- Complications :
  - a. Hemorrhage
  - b. Uro-genital injuries
  - c. Nerves of lumbo-sacral plexus
  - d. Diaphragm (rare)

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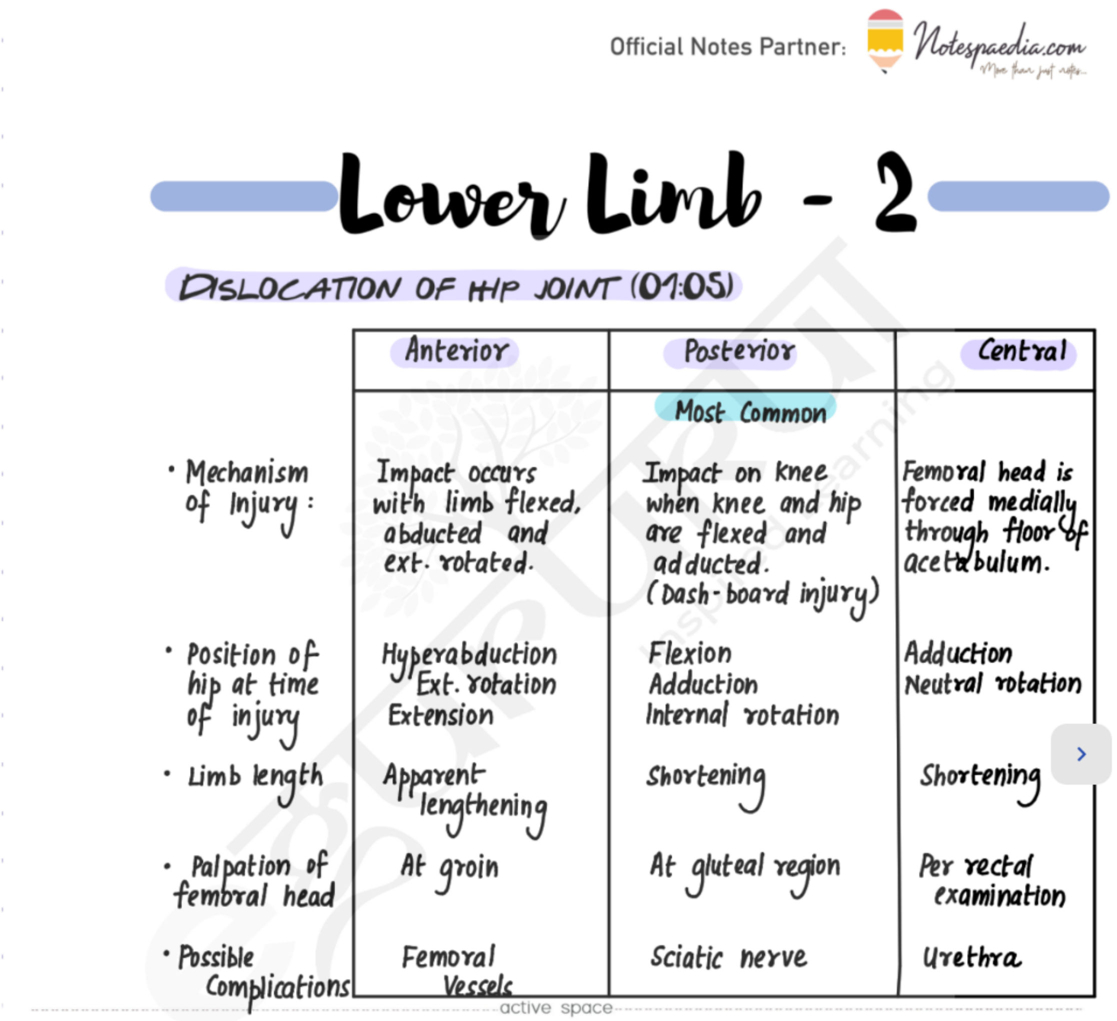
For more notes, Follow "medicadet3" on instagram



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Lower Limb - 2

DISLOCATION OF HIP JOINT (01:05)

	Anterior	Posterior Most Common	Central
• Mechanism of Injury :	Impact occurs with limb flexed, abducted and ext. rotated.	Impact on knee when knee and hip are flexed and adducted. (Dash-board injury)	Femoral head is forced medially through floor of acetabulum.
• Position of hip at time of injury	Hyperabduction Ext. rotation Extension	Flexion Adduction Internal rotation	Adduction Neutral rotation
• Limb length	Apparent lengthening	Shortening	Shortening
• Palpation of femoral head	At groin	At gluteal region	Per rectal examination
• Possible Complications	Femoral Vessels	Sciatic nerve	Urethra

active space

For more notes, Follow "medicadet3" on instagram

CLASSIFICATION FOR POSTERIOR DISLOCATION OF HIP (09:05)

Thompson and Epstein Classification.

- Type I to Type V
  ↓
  When the dislocation occurs with # of femoral head.
  ↓
  Subdivided by Pipkin's Classification
  ↓
  - Type I - Femoral head # Caudal to fovea centralis
  - Type II - Femoral head # Cephalic to fovea centralis
  - Type III - Femoral head # + Femoral neck #
  - Type IV - Type I/II/III with acetabular #

Vascular Sign of Nareth

- In PDH, femoral artery pulsations are not palpable.
- PDH / CDH

TREATMENT (16:48)

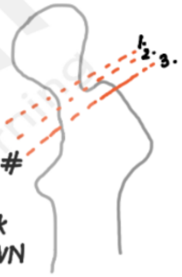
- Methods of Reduction :

a. East Baltimore method
b. Allis method
c. Bigelow
d. Stimpson method

active space

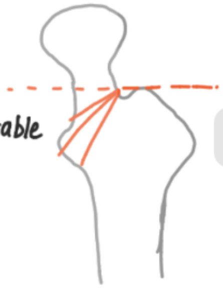
NECK OF FEMUR FRACTURE (19:20)

- **Risk factors** :
  - Postmenopausal / Age related Osteoporosis
  - Diabetes
  - Alcoholic



- **Classifications used** :

a. **Anatomical classification**
- Subcapital } Intra
- Transcervical } capsular #
  ↓
  High risk of AVN
- Basicervical
  ↓
  Extracapsular#
  ↓
  High risk of malunion

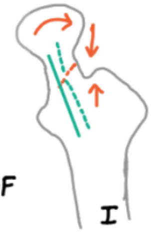


b. **Powell's classification**

Type I	< 30°	Higher angle → More unstable
Type II	30°-50°	
Type III	>50°	

Angle between fracture line and horizontal.

c. **Garden's classification** : Based on alignment of trabaculae



Type I : Incomplete # ; Valgus impacted #;
Trabaculae not aligned

Type II : Complete # ; undisplaced #
Trabaculae aligned

Type III : Incompletely displaced #
Femoral head has not lost contact with NOF
But head is in varus and extended
So alignment broken

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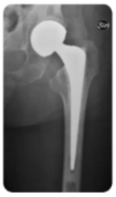
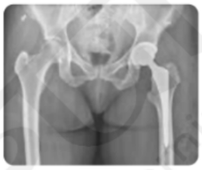
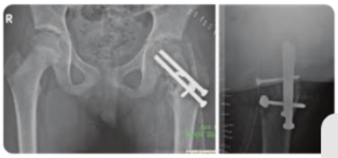
Type IV: Completely displaced
Trabaculae lines are not aligned in neck

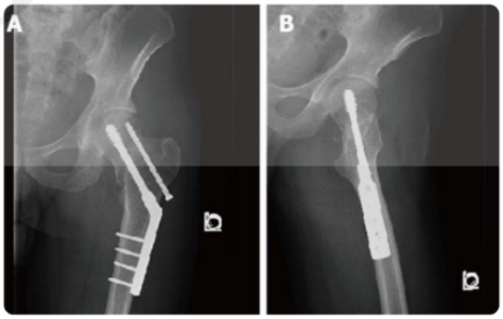


TREATMENT (33:30)



1. Age of patient (65 years)
   - <65 years
     - <3 weeks
       - Subcapital/Transcervical # ↓ Cannulated Cancellous Screw fixation
       - Basicervical # ↓ Pediatric DHS
     - >3 weeks
       - MRI
       - Meyer's Pedicle graft ↓ Quadratus femoris
       - Valgus osteotomy ↓ For displaced #
   - >65 years ↓
     - Hemiarthroplasty
     - THR (If pre-existing arthritis present)





# NOF	# IT
• Shortening < 1 inch	Shortening > 1 inch
• ER of limb < 45°	The lateral margin of sole is touching the couch.
• Tenderness in groin.	Over greater trochanter.

COMPLICATIONS (42:00)

1. Avascular Necrosis (MC)
2. Non-union
3. Malunion

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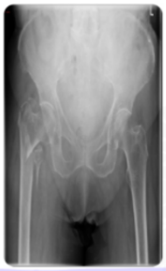
eGurukul Inspired Learning

Lower Limb - 3

INTERTROCHANTER FRACTURE (00:20)

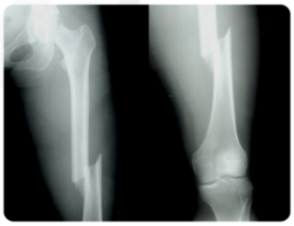


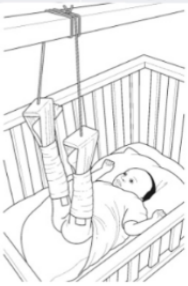
- Classification – Boyd and Griffin
- Implants – 1. DHS
  2. Proximal femoral nail

SHAFT OF FEMUR FRACTURE (01:15)

- Implant of choice – Intramedullary nail
  – Plates/ Ext. fixation

Age group	Tt of choice
0-6 months	Pavlik harness / SPICA
6 months-2 years	Spica/ gallow's traction
2-5 yrs	Russel traction
10-15 yrs	90-90 femoral skeletal traction
If fails	Surgical intervention
	Flexible / Rigid nails





Inspired Learning

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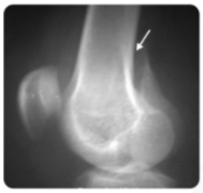
HOFFA'S FRACTURE (04:10)



Fracture of one or both femoral condyles in coronal plane.

PATELLA FRACTURE (04:45)

- Undisplaced # → Cylindrical / tube cast
- 2 part # → Tension band wiring

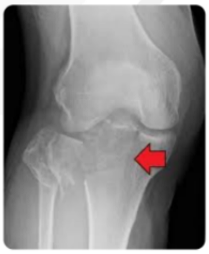
  ↓

  # Olecrenon

  # Medial malleolus
- Communited # → Lower part : Partial Patellector

  Whole patella : Total Patellecto

BUMPER'S FRACTURE (08:00)



- Depressed # of lateral tibial plateau with injury to LCL and ACL.

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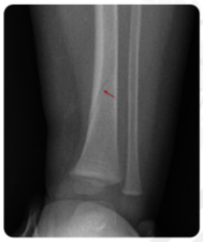
ISOLATED TIBIA FRACTURE, INTACT FIBULA (09:33)

If it shows delayed union / non-union
↓
Excision of fibula (Segmental)

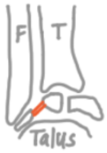
TODDLER'S FRACTURE (11:40)



- Oblique # of distal tibia in children

ANKLE EPONYMS (12:22)

1. Pott's fracture - Bimalleolar #
2. Cotton's # - Trimalleolar #
3. Pilon's # - Distal tibia involving tibial plafon.
4. Maisonnaive # - Spiral # of proximal fibula with ankle injury
5. Tillaux # - Avulsion of tibial fragment by ant. tibial ligament
Salter Harris Type III



active space

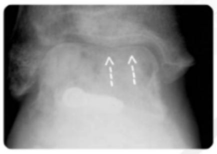
TALUS FRACTURE (17:32)

- Eponyms : a. Aviator's # → # Neck of talus
  b. Shepherd # → # Post. process of talus
  c. Snowboard # → # Lat. process of talus

- Complication → Arthritis > AVN

- IOC → MRI

- Hawkin's sign - White line



↓

Subchondral radiolucent band suggestive of atrophy of talus dome (AP view)

↓

Retained vascularity of talus (6-8 weeks)

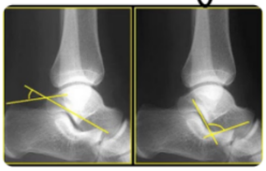
↓

Excludes Osteonecrosis

However, it is not a specific sign.

CALCANEAL FRACTURE (22:52)

- MC tarsal to get #ed
- Associated injuries
- Angles of calcaneum -
  a. Bowler's angle (N: 20°-40°)
  b. Crucial angle of Gissane (N- 100°-120°)



- In Intra-articular #,
  Bowler's angle ↓
  Gissane. ↑

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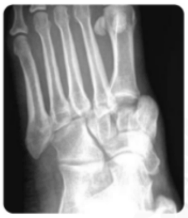
- IDC
- 3D CT Scan

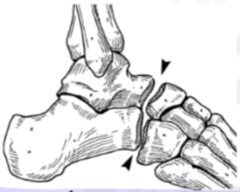
LISFRANC FRACTURE (25:20)



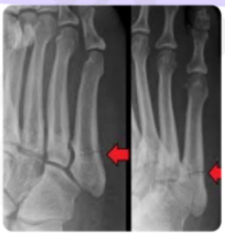
- Tarso - metatarsal joint injury

CHOPART FRACTURE (25:20)

- Intertarsal joint injury



JONES' FRACTURE (26:30)



- Injury to base of 5th metatarsal
  ↓
  due to Peroneus brevis

STRESS FRACTURE (27:30)

- Excessive stress to a normal bone → Stress #
- # in abnormal bone with normal stress → Insufficiency #

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Inspired Learning

- C/F → Associated with Marching → March #
  - Tenderness around 2nd MT neck for 2-4 weeks after beginning the aerobics/running.
- IOC → MRI
- Potential sites for Stress #

a. Femoral neck (Tension side)
b. Patella
c. Ant. cortex of tibia
d. Medial malleolus
e. 5th MT Proximal metaphysis
f. Talar neck
g. Sesamoid of great toe

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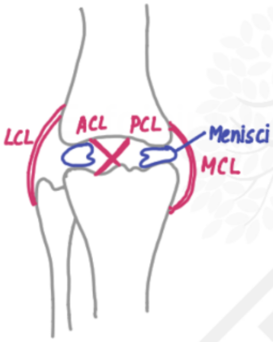
Sports Injuries - 1

KNEE JOINT (01:00)



Cruciate Ligaments

- Mechanism of injury to ligaments of knee:

MC- Flexion, Abduction, Int. Rotation of femur on fixed tibia
(When impact occurs laterally)

1st structure to get damaged = MCL;
When associated with injury to ACL and Medial meniscus
↓
"Terrible Triad of knee"
"Unhappy Triad of O'donoghue"

C/F:- Swelling around jt.
↓
'Haemarthrosis'

- Feeling of giving way of knee

ACL		PCL
⟵	Extra synovial	⟶
⟵	Intra-capsular	⟶

- Attachment:

ACL	PCL
a. On tibia: Immediately behind the ant. horn of med. meniscus Upwards, backwards and laterally to join the post. part of medial surface of lateral femoral condyle.	a. On tibia: Behind post. horn of medial meniscus. Upwards, forward and medially to join the post. part of lateral surface of medial femoral condyle.

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- Anteromedial Bundle → Tight in flexed knee
- Posterolateral Bundle → Tight in extended knee

Anterolateral bundle →

Posteromedial bundle →

- Injuries of ACL are more common than PCL. (Avulsion)

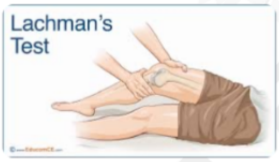
- Clinical tests: a. Lachman's test
  - Acute cases ← 20° knee flexion
  - b. Ant. drawer test
  - 90° knee flexion
  - c. Pivot shift test

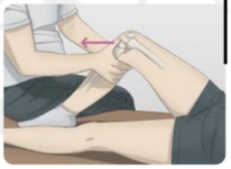
a. Posterior tibial sag

b. Posterior drawer test

c. Reverse pivot shift test

d. Quadriceps active test





- Investigation: MRI / Arthroscopy → Definitive / Diagnostic
- Treatment: Reconstruction of ligament → Hamstrings
  ↓
  Semitendinosus (MC)

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ROTATORY INSTABILITY OF KNEE (24:10)

Instability	Damaged structure	Test done
• Anterolateral	• ACL, LCL • Lateral knee capsule	• Pivot shift test • Ant. drawer test with foot int. rotated to 30°
• Anteromedial	• ACL, MCL • Medial knee capsule	• Ant drawer test with foot ext. rotated to 15°
• Posterolateral	• PCL, LCL • Arcuate ligament • Popliteus	• Reverse pivot shift test • Dial test

"Bounce Home test / Passive extension test"

Patient lies supine → Foot is placed in examiner's hand → knee is completely flexed and allowed to extend passively

Normally, knee should extend completely → (N) feel : Sharp, firm or solid endpoint

The feel can never be empty.

COLLATERAL INJURIES (33:35)

- Tested by Varus or Valgus Stress test.
- MCL (Tibial collateral lig.) → usually the 1st to get injured.

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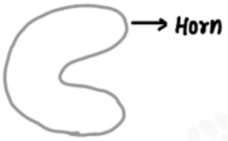
MENISCAL INJURY (35:46)



- Functions : - Prevent impingement of capsule and synovium during movements
  - Lubricating action
- Mech. of injury : Rotation on semiflexed knee (MC)
- C/F : Recurrent locking of knee joint

★ Medial meniscus more commonly injured than lateral meniscus.
↓
- Lies in weight bearing axis.
- Larger than lateral meniscus.
- Attached at margins by capsule of knee joint.

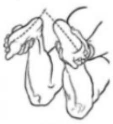


FIG. 3
Rotation both knees

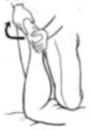
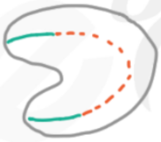


FIG. 4
Rotation alone

- Clinical tests : - McMurray's Test : Supine position
  - Apley's grinding Test : Prone position
  - Squat test

- Investigation : MRI / Arthoscopy



1. Vertical tear (MC)
   Bucket handle tear (Post. horn of menisci)
2. Horizontal tear
3. Radial tear
4. Combination

- Treatment

→ Red zone → Repair
→ White zone → Excision (Partial Menisectomy)

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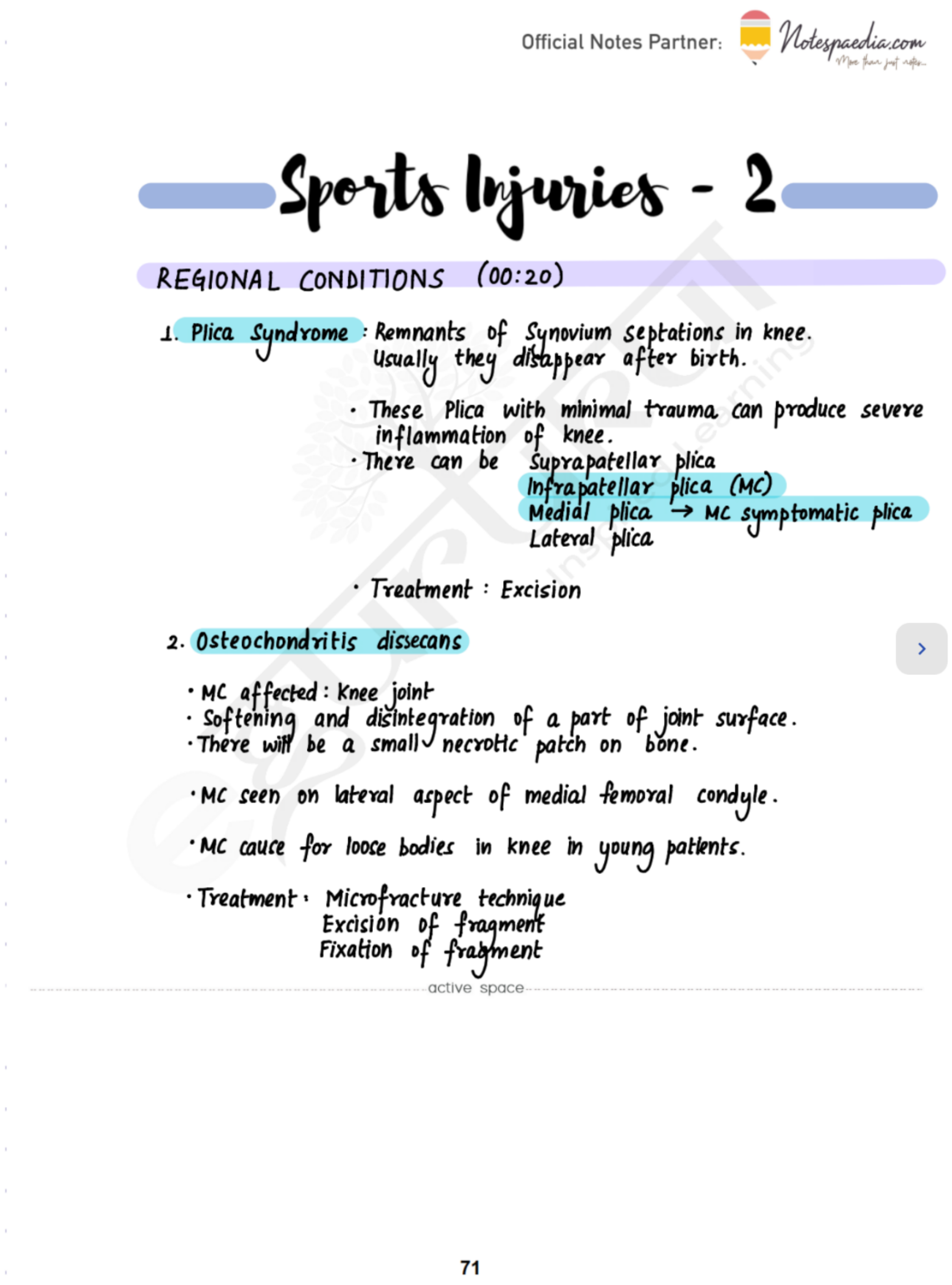

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Sports Injuries - 2

REGIONAL CONDITIONS (00:20)

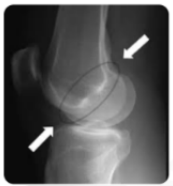
1. **Plica Syndrome** : Remnants of Synovium septations in knee.
   Usually they disappear after birth.
   - These Plica with minimal trauma can produce severe inflammation of knee.
   - There can be Suprapatellar plica
     Infrapatellar plica (MC)
     Medial plica → MC symptomatic plica
     Lateral plica
   - Treatment : Excision

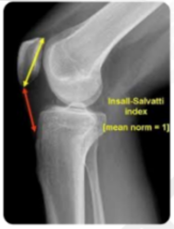
2. **Osteochondritis dissecans**
   - MC affected : Knee joint
   - Softening and disintegration of a part of joint surface.
   - There will be a small necrotic patch on bone.
   - MC seen on lateral aspect of medial femoral condyle.
   - MC cauce for loose bodies in knee in young patients.
   - Treatment : Microfracture technique
     Excision of fragment
     Fixation of fragment

PATELLA ALTA / BAJA (08:00)

ALTA ↓ High riding patella

BAJA ↓ Low lying patella





Blumensaat line : Line through roof of intercondylar notch
Lower pole of patella should touch this line

Insell Salvati Index : $\frac{\text{Patellar tendon length}}{\text{Patellar length}}$

(N) 0.8 - 1.2
< 0.8 - Patella Baja / infra

CHONDROMALACIA PATELLA (12:35)

- Young patients, females, related with abnormal position of knee
- C/F : Patients cannot keep knee flexed for long (softening of undersurface)
  Theatre / Cinema Hall sign
- Treatment : Rest
  NSAIDs
  Muscle stretching → Hamstring, Quadriceps

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Q- ANGLE (15:48)

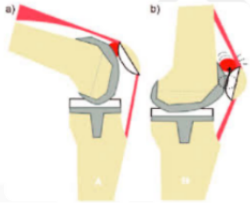
Angle formed between the line joining ASIS → center of patella → Tibial Tuberosity

Q : Quadriceps

(N) angle in ♂ = 8°-10°
♀ = 15° ± 5°

Q-angle ↑sed : Genu valgum
↑ femoral anteversion
Ext. tibial torsion
Laterally positioned tibial tuberosity

PATELLAR CLUNK SYNDROME (19:10)



- Clunk heard at 30°-45° of knee flexion while the knee is being extended
- Nodule is formed at superior pole of pate
at post. surface of quadriceps tendon.

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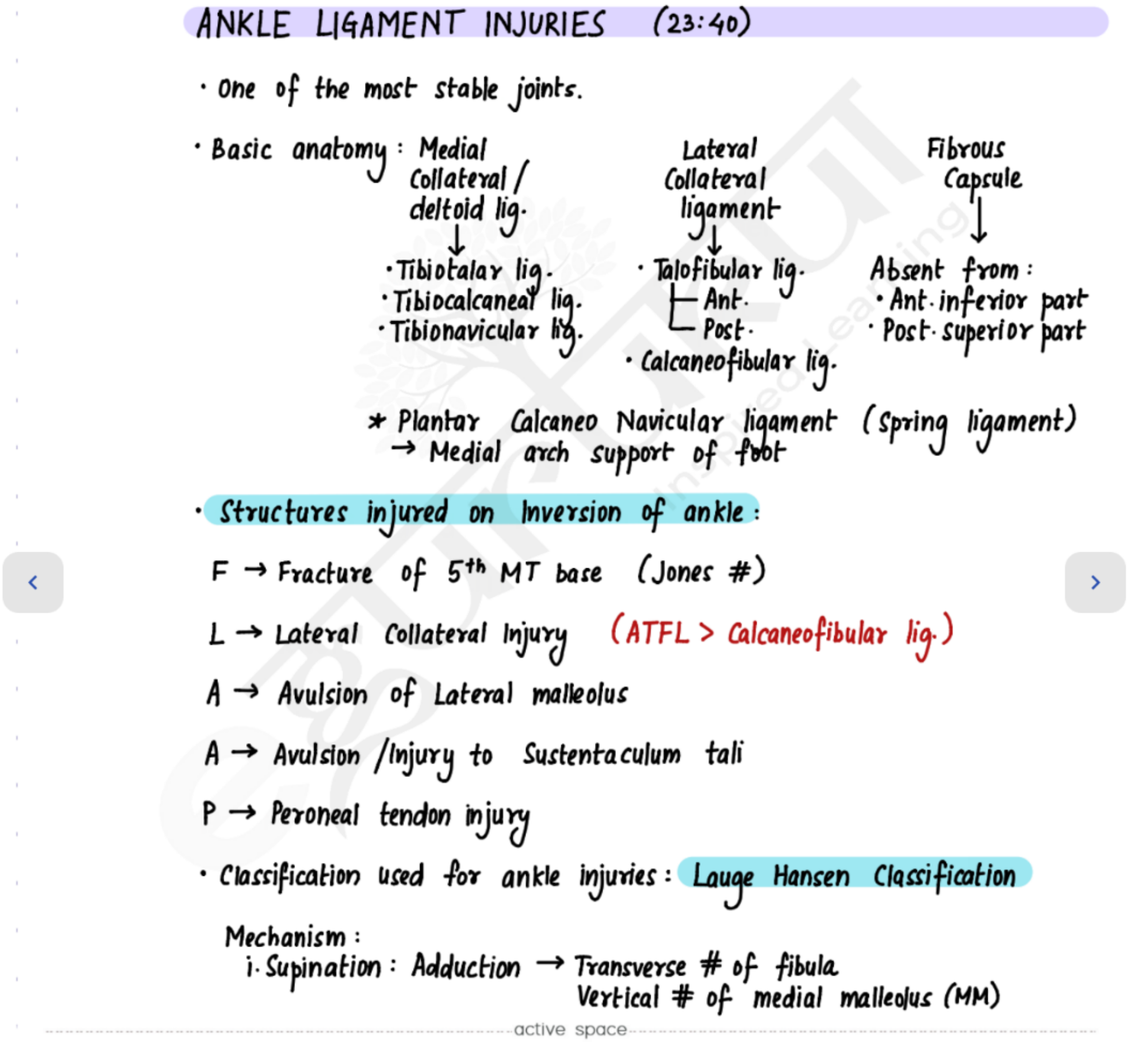

ANKLE LIGAMENT INJURIES (23:40)

- One of the most stable joints.
- Basic anatomy :
  - Medial Collateral / deltoid lig. →
    - Tibiotalar lig.
    - Tibiocalcaneal lig.
    - Tibionavicular lig.
  - Lateral Collateral ligament →
    - Talofibular lig.
      - Ant.
      - Post.
    - Calcaneofibular lig.
  - Fibrous Capsule → Absent from :
    - Ant. inferior part
    - Post. superior part

  * Plantar Calcaneo Navicular ligament (Spring ligament)
    → Medial arch support of foot

- Structures injured on Inversion of ankle :

  F → Fracture of 5th MT base (Jones #)

  L → Lateral Collateral Injury (ATFL > Calcaneofibular lig.)

  A → Avulsion of Lateral malleolus

  A → Avulsion /Injury to Sustentaculum tali

  P → Peroneal tendon injury

- Classification used for ankle injuries : Lauge Hansen Classification

  Mechanism :
  i. Supination : Adduction → Transverse # of fibula
  Vertical # of medial malleolus (MM)

ii. Supination : Eversion → ATFL injury
MC mechanism
Deltoid ligament
MM / # Post. malleolus / distal fibula

iii. Pronation : Abduction → # MM
Rupture of Syndesmotic lig.
# fibula above joint

iv. Pronation : Eversion → # MM
# fibula (above joint)
Tibiofibular lig.

v. Pronation : Dorsiflexion → # MM / Ant. margin of tibia
# fibula (above level of MM)

CHRONIC ANKLE INSTABILITY (38:50)

- Seen after repeated ankle sprains.
- Treatment : Conservative → Lateral wedge added to shoe heel.
  Low heels / No heels
  Muscle streching

  Surgical → Brostrom procedure (ATFL repair)
  Watson Jones operation : Peroneus brevis tendon used to reconstruct ATFL or Calcaneofibular lig.
  Evans technique

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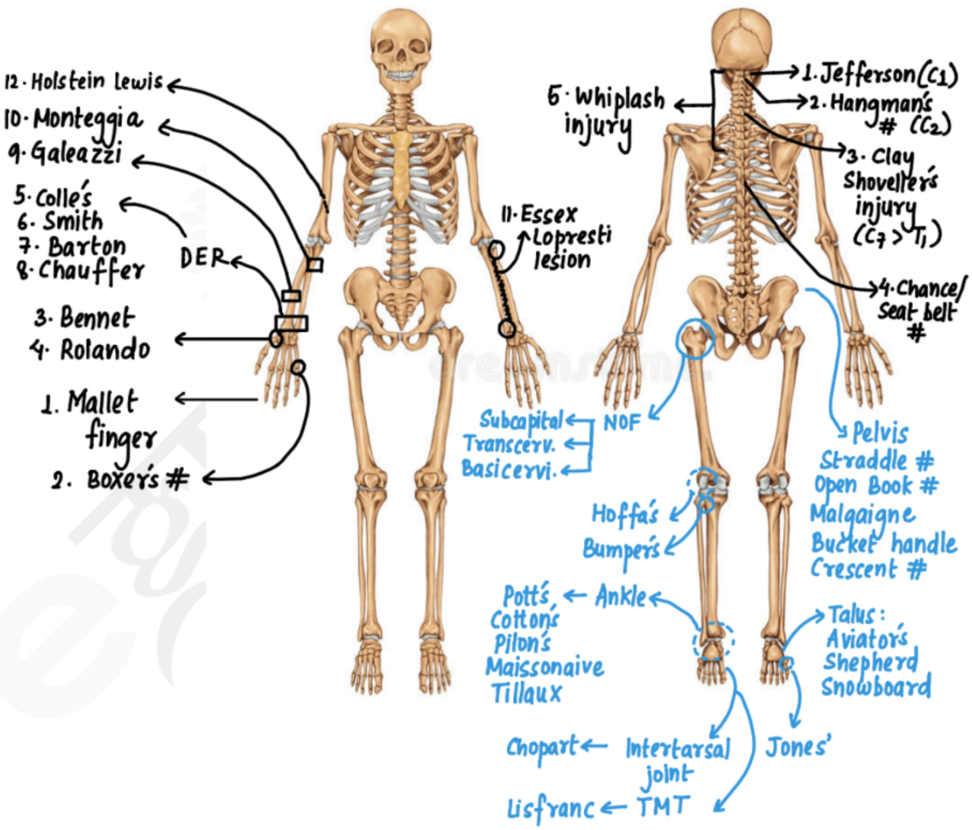
Eponyms of Fractures



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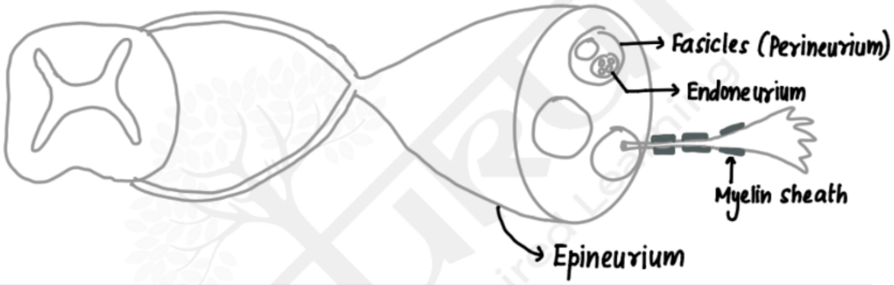
Basic Peripheral Nerve Injuries

STRUCTURE OF PERIPHERAL NERVE (01:30)



CLASSIFICATION OF PERIPHERAL NERVE INJURIES (06:00)

Seddon's		Sunderland
Neuropraxia	←	Type I
Axontemesis ± Endoneurial injury	←	Type II
		Type III/IV : Combination of Type I and Type II
Neurotemesis	←	Type V
		Type VI : Combination of any (Type I-V)

DEGENERATION OF NERVE (11:30)

Proximal end : Primary or Retrograde degeneration
Distal end : Wallerian degeneration

REGENERATION OF NERVE (12:30)

- Occurs @ 1 inch/month ≈ 1mm/day
- Clinical assessment – `Tinel's sign'

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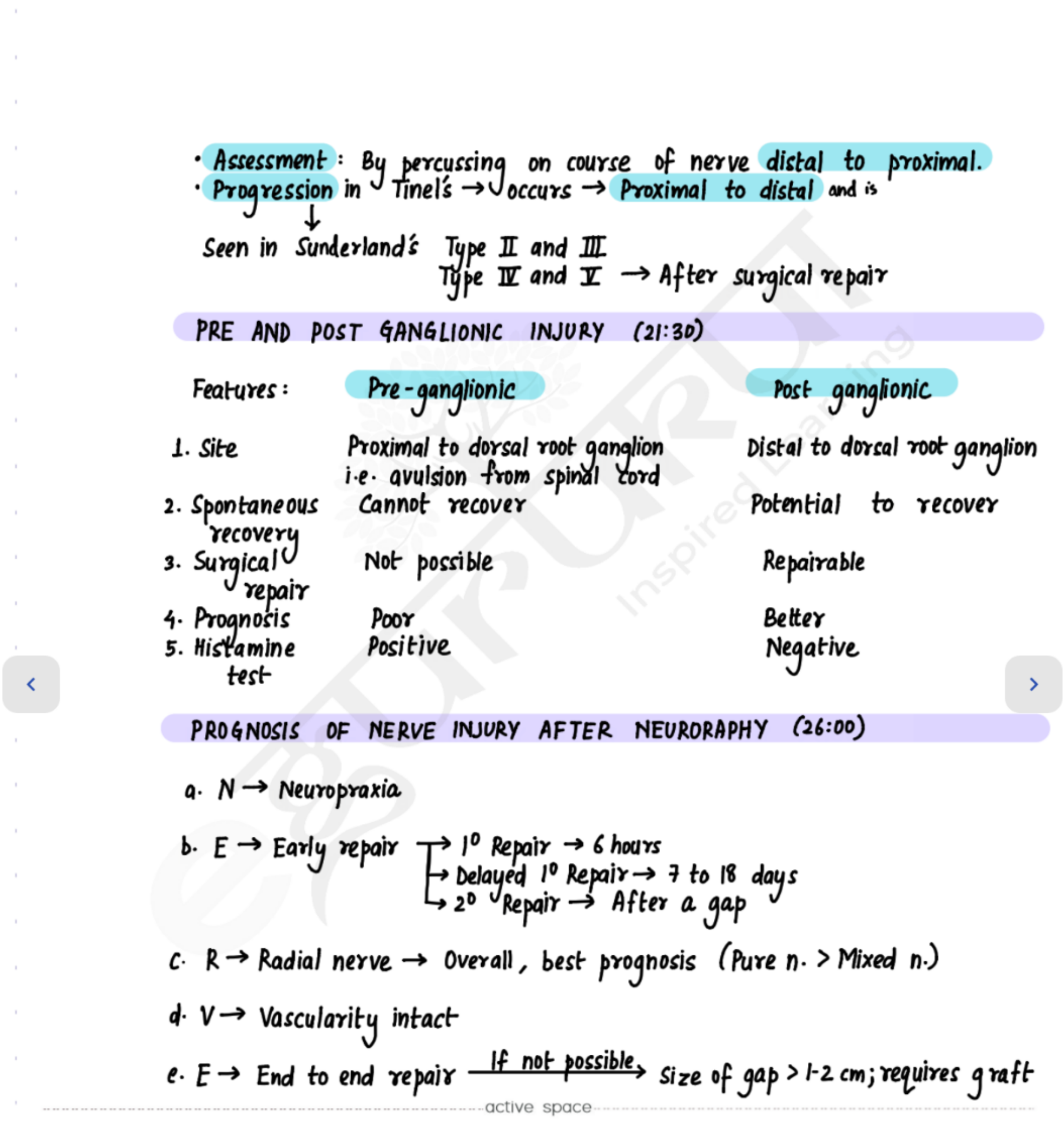

- **Assessment**: By percussing on course of nerve distal to proximal.
- **Progression** in Tinel's → occurs → Proximal to distal and is
  ↓
  Seen in Sunderland's Type II and III
  Type IV and V → After surgical repair

PRE AND POST GANGLIONIC INJURY (21:30)

Features:	Pre-ganglionic	Post ganglionic
1. Site	Proximal to dorsal root ganglion i.e. avulsion from spinal cord	Distal to dorsal root ganglion
2. Spontaneous recovery	Cannot recover	Potential to recover
3. Surgical repair	Not possible	Repairable
4. Prognosis	Poor	Better
5. Histamine test	Positive	Negative

PROGNOSIS OF NERVE INJURY AFTER NEURORAPHY (26:00)

a. N → Neuropraxia

b. E → Early repair
  - → 1° Repair → 6 hours
  - → Delayed 1° Repair → 7 to 18 days
  - → 2° Repair → After a gap

c. R → Radial nerve → Overall, best prognosis (Pure n. > Mixed n.)

d. V → Vascularity intact

e. E → End to end repair $\xrightarrow{\text{If not possible,}}$ Size of gap > 1-2 cm; requires graft gap of :

- Median n. - 2 cm
- Ulnar n. - 4-5 cm
- Sciatic n. - 6-8 cm

} can be managed by nerve mobilisation

f. G → Growing age (Young > Elderly)

SUTURING OF NERVE (32:00)

8-0, 9-0, 10-0 Monofilament Nylon are used.

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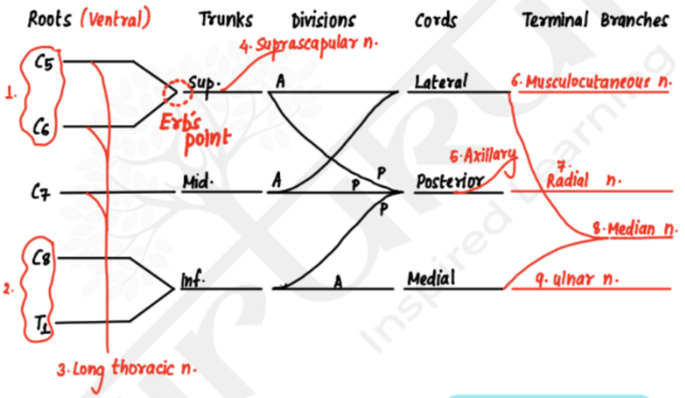
Specific Nerve Injuries - 1

BRACHIAL PLEXUS (00:30)



★ Splint used for Brachial Plexus injury : Aeroplane splint

ERB'S PALSY (09:20)

- MC nerve injury associated with delivery.
- It occurs due to injury at Erb's point.
- Paralysed nerves :
    i. Root C5
    ii. Root C6
    iii. Musculocutaneous n.
    iv. Axillary n.
    v. Nerve to subclavius
    vi. Suprascapular nerve
- Attitude of limb – Arm : Adducted ; Limb : Int. rotated and Pronated
  Elbow : Extended "Policeman's tip deformity"

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Muscles involved:

- **Movements lost:** Arm - Abducted → Supraspinatous, Deltoid
  Elbow - Flexion → Biceps, Brachialis
  Limb - ER and Supination → Infraspinatous, Teres minor, Supinator

KLUMKE'S PALSY (16:50)

- C8 and T_1 involved.
- T_1 → Provides segmental supply to intrinsic muscles of hand.
  So, paralysis leads to **Claw hand appearence.**
  ↓
  unopposed action of long flexors and extencor of fingers
- Sensory loss on medial aspect of forearm (T_1) and hand upto little finger (C8)
- Wasting of muscles
- If C8-T_1 injury is associated with involvement of Cervical sympathetic ganglia
  ↓
  Horner's Syndrome
  — Ptosis
  — Miosis
  — Anhydrosis
  — Enophthalmos
  — Loss of ciliospinal reflex

LONG THORACIC NERVE (22:40)

- Supplies Serratus anterior
  ↓
  Paralysis → **Winging of Scapula**

SUPRASCAPULAR NERVE (24:00)

Supplies Supraspinatus → Abduction (0-15°)] Atrophy of shoulder girdle
Infraspinatus → ER

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AXILLARY NERVE (25:20)

Supplies Deltoid → Abduction (15°-90°)
Teres minor → ER

MUSCULOCUTANEOUS NERVE (26:15)

Supplies Biceps } Flexion of elbow
Brachialis }
Coracobrachialis - Flexion of shoulder
Adduction of shoulder

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Specific Nerve Injuries - 2

RADIAL NERVE (00:10)

- Continuation of Post. cord of brachial plexus
- $C_5 - T_1$
- Nerve Supply :

a. Above elbow

i. Above spiral groove
- Triceps (long hand)
- Post. cutaneous n. of arm

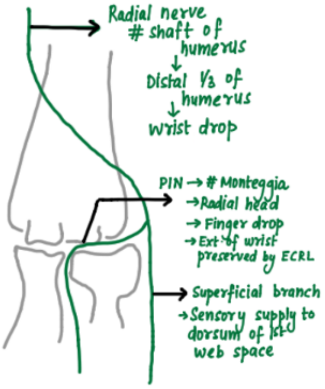
ii. In Spiral groove
- Post. cut. n. of forearm
- Lat. cut. n. of arm
- Anconeus
- Triceps

iii. B/w spiral groove and lat. epicondyle
- Brachialis
- Brachioradialis
- ECRL

- Wrist drop
  Finger drop] Cock up splint

b. Below elbow

i. By Post. interosseus n.
- APL
- EPL and EPB
- Extensor indices
- Supinator
- Ext. digitorum
- Ext. digiti minimi
- ECU
- ECRB



Radial nerve
# shaft of humerus
↓
Distal 1/3 of humerus
↓
wrist drop

PIN → # Monteggia
→ Radial head
→ Finger drop
→ Ext. of wrist preserved by ECRL

Superficial branch
→ Sensory supply to dorsum of 1st web space

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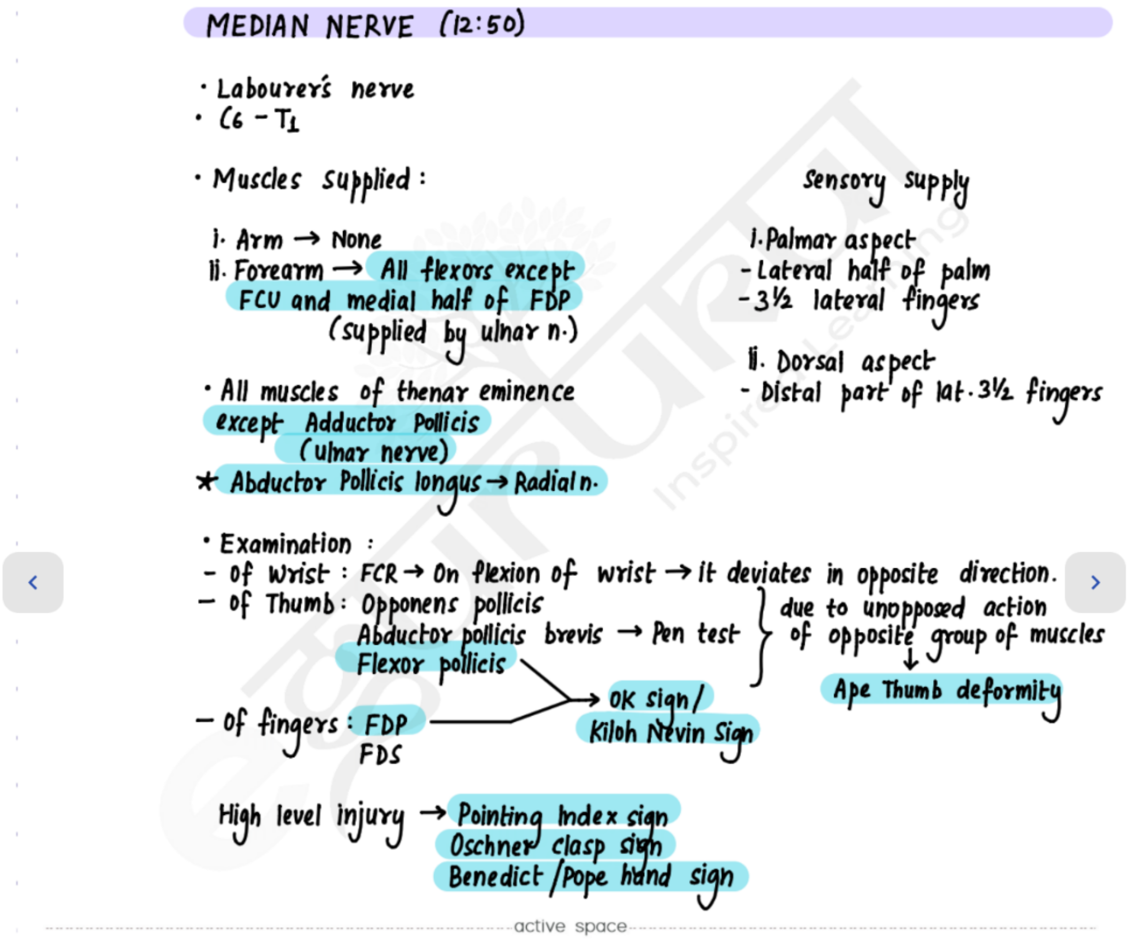

MEDIAN NERVE (12:50)

- Labourer's nerve
- C6 – T1

- Muscles supplied :

i. Arm → None
ii. Forearm → All flexors except FCU and medial half of FDP (supplied by ulnar n.)

- All muscles of thenar eminence except Adductor Pollicis (ulnar nerve)

★ Abductor Pollicis longus → Radial n.

Sensory supply

i. Palmar aspect
- Lateral half of palm
- 3½ lateral fingers

ii. Dorsal aspect
- Distal part of lat. 3½ fingers

- Examination :

– of Wrist : FCR → On flexion of wrist → it deviates in opposite direction.
– of Thumb : Opponens pollicis
Abductor pollicis brevis → Pen test
Flexor pollicis

} due to unopposed action of opposite group of muscles ↓ Ape Thumb deformity

– of fingers : FDP
FDS

Flexor pollicis, FDP → OK sign / Kiloh Nevin Sign

High level injury → Pointing Index sign
Oschner clasp sign
Benedict / Pope hand sign

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ULNAR NERVE (30:20)

- Musician's nerve
- $C_7, C_8 - T_1$

- Wrist : FCU : On flexion wrist goes in opposite deviation
- Thumb : Adductor pollicis : **Book test** – Use of Flexor pollicis
  ↓
  "**Froment sign**"
- Fingers : FDP

High level
- FCU, FDP

to ring / little finger paralysed
↓
"**Ulnar paradox**"

Low level
- **Claw hand**

- Interossei – Palmar : PAD → Card test
  Dorsal : DAB → Egawa test

★ **When both Ulnar and Median are paralysed → Complete Claw Hand**

active space

Inspired Learning

Entrapment Neuropathies

i. Carpal tunnel → Median nerve

ii Guyon's canal → Ulnar nerve

iii. Pronator syndrome → Median n. under Pronator teres

iv. Chieralgia paresthetica → Superficial branch of Radial n.

v. Cubital tunnel syndrome → Ulnar n. between 2 heads of FCU

vi. Radial tunnel syndrome →
- Origin of ECRB
- Radial head
- Arcade of Frohse
- Radial Recurrent Arterial Fan

vii. Thoracic outlet syndrome → Lower trunk of brachial plexus

viii. Inguinal ligament → Lat. cut. n. of thigh → Meralgia paresthetica

ix. Fibular neck → Common peroneal n. → Foot drop

x. Tarsal tunnel → Tibial n.

xi. Digits (toes) → Digital n. → Morton's metatarsalgia

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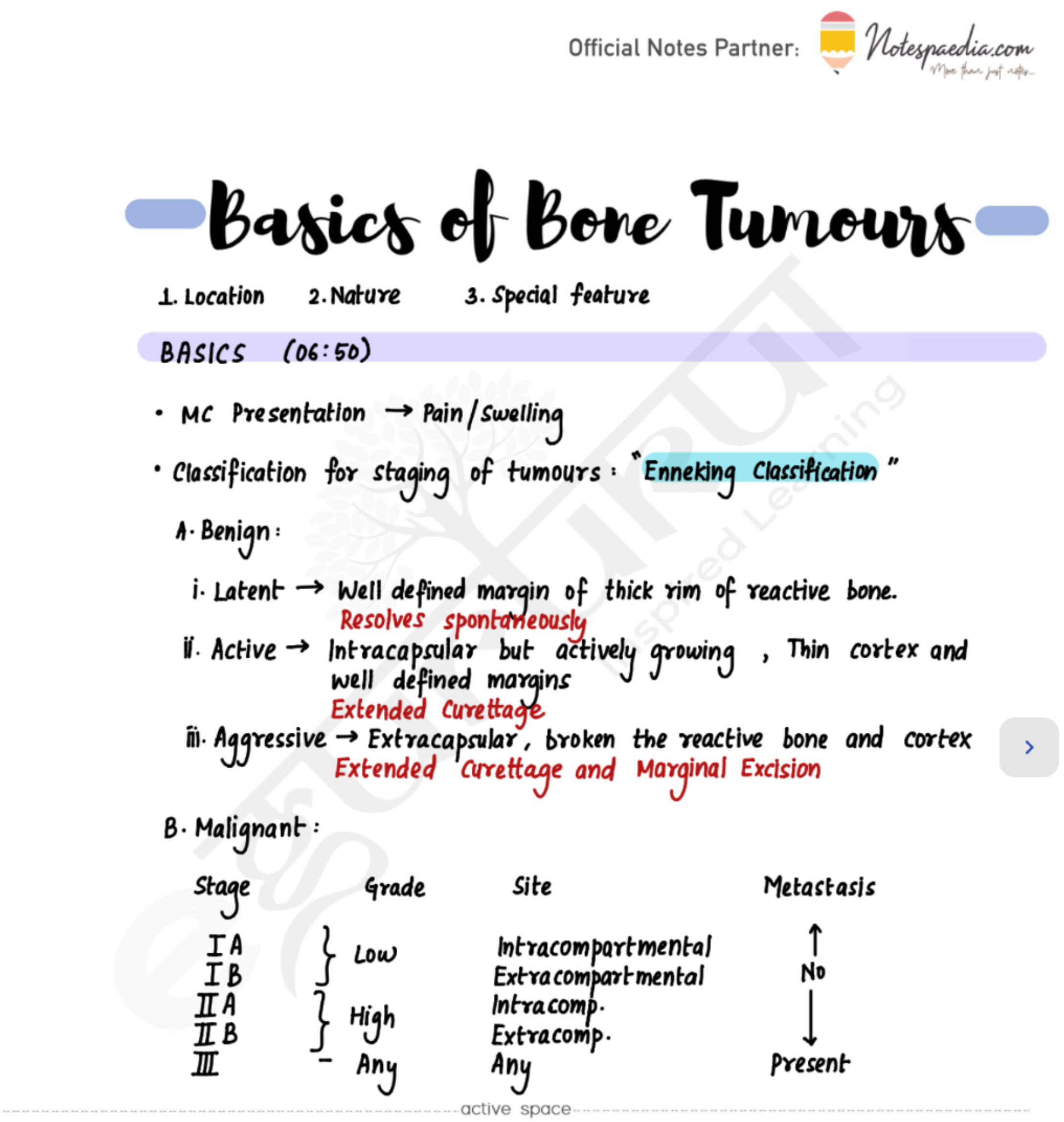


Basics of Bone Tumours

1. Location 2. Nature 3. Special feature

BASICS (06:50)

- MC Presentation → Pain / Swelling
- Classification for staging of tumours : "Enneking Classification"

A. Benign :

i. Latent → Well defined margin of thick rim of reactive bone.
Resolves spontaneously

ii. Active → Intracapsular but actively growing , Thin cortex and well defined margins
Extended Curettage

iii. Aggressive → Extracapsular, broken the reactive bone and cortex
Extended Curettage and Marginal Excision

B. Malignant :

Stage	Grade	Site	Metastasis
I A	Low	Intracompartmental	No
I B		Extracompartmental	
II A	High	Intracomp.	
II B		Extracomp.	
III	Any	Any	Present

SCORING SYSTEM FOR PREDICTION OF PATHOLOGICAL # (15:30)

MIREL'S CRITERIA

Variable	1	2	3
Site	Upper limb	Lower limb	Peritrochanter
Pain	Mild	Moderate	Severe
Size	< 1/3	1/3 - 2/3	> 2/3
Lesion	Blastic	Mixed	Lytic
	4		12

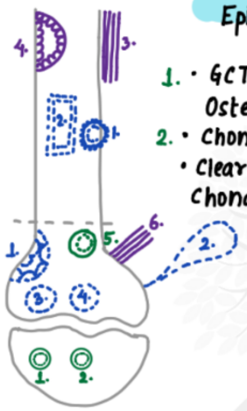
- When to go for prophylactic fixation ? ≥ 8 Score

PULSATILE BONE TUMOURS (20:10)

A. Osteosarcoma
B. Giant Cell tumour
C. Aneurysmal Bone Cyst
D. Angioendothelioma
E. Renal and Thyroid metastasis

active space

LOCATION OF TUMOURS / NATURE OF TUMOURS (21:20)



Epiphysis

1. • GCT Osteoclastoma] Benign Aggresive
2. • Chondroblastoma
   • Clear cell Chondrosarcoma

Metaphysis

1. • Non ossifying fibroma
2. • Osteochondroma
3. • Unicameral Bone cyst
4. • Aneurysmal Bone cyst] Benign
5. • Osteoblastoma Benign Aggresive
6. • Osteosarcoma Malignant

Diaphysis

1. • Osteoid Osteoma
2. • Fibrous dysplasia] Benign
3. • Ewing's sarcoma
4. • Adamantioma] Malignant

D/D FOR MULTIPLE LESIONS (POLYOSTOTIC LESION) (34:10)

A. Histiocytosis
B. Enchondroma
C. Osteochondroma
D. Fibrous dysplasia
E. Multiple myeloma
F. Metastasis
G. Hemangioma
H. Infections
I. Hyperparathyroidism

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LESIONS OF SPINE (36: 40)

>40 Years - Metastasis
Multiple myeloma
Hemangioma
Chordoma (Sacrum)

<30 years - Histiocytosis
Hemangioma
Osteoid osteoma }
Osteoblastoma } Post. elements
ABC }

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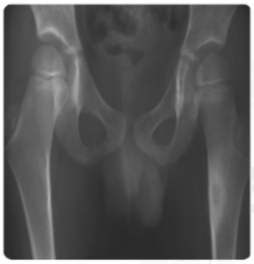
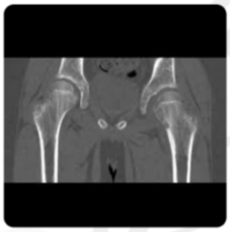
Benign Lesions of Bone

OSTEOID OSTEOMA (00:40)



- MC true benign bone tumour.
- Children ; <30 years ; Males > Females
- Pain, NSAIDs give relief (PG and COX in lesion)
- Any bone can be involved except skull.

- Investigations:
  - X-ray : lytic lesion with sclerosis
  - CT-Scan: Nidus < 1·5 cm
  - Tc_{99} : Increased uptake
  - Double density sign – Hotter spot in hot a
    s
    ↓
    Central focus of ↑ uptake within surrounding lower uptake



- Treatment : NSAIDs
  Pelvis/long bone - Radiofrequency ablation
  Enblock resection / Curettage

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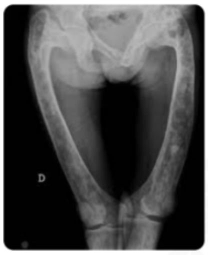
FIBROUS DYSPLASIA (07:14)



- Bone / marrow replaced by fibrous tissue
- Diaphysis > Meta/Epi
- Developemental anomaly
- 1st - 3rd decade
- Hypophosphatemia may be associated.
- Proximal femur / Tibia > Ribs > Maxilla
- Malignant transformation is rare.

- Histology: Appearence of irregular woven bone spicules with fibrous stroma
  ↓
  Chinese letter pattern appearence

- X-ray: Shepherd crook deformity
  Ground glass appearence

- Syndromic associations:
  - McCune Albright syndrome: Polyostotic fibrous dysplasia with cutaneous pigmentation and endocrine abnormalities.
  - Mazabraud Syndrome: Polyostotic fibrous dysplasia with intramuscular myxomas.

- Treatment:
  - For extensive disease : Bisphosphonate
  - Pain / deformity / Pathological # : Osteotomy + IF

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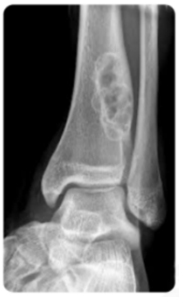
NON OSSIFYING FIBROMA (14:50)



- Fibrous cortical defect
- Developemental anomaly
- Seen in 30-35% children
- MC benign bone lesion
- Not a true tumour

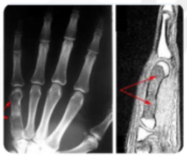
- Histology : Defect is filled with spindle shaped cells distributed in whorled or storiform pattern.
  : Giant cells and foam cells always present.

- X-ray : Well defined, lobulated lesion, located eccentrically at metaphysis

- Treatment : Dissolve spontaneously with skeletal maturity
  : Curettage and bone grafting

CHONDROMA (20:46)

- Tumour of hyaline cartilage
  - Phalanges - Enchondroma



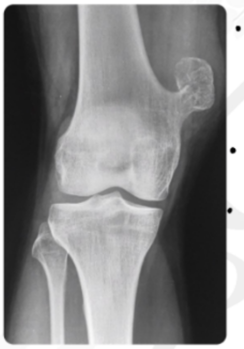
- MC tumour of hands (Phalanges)
- Islands of hyaline cartilage
- Metaphysis of long bones (enchondral ossification)

- Syndromic relations :
  - Ollier's disease : Multiple enchondromatoses with deformity and growth stunting. (3-5% malignancy risk)
  - Maffucci syndrome : Multiple enchondromatoses with multiple hemangioma
    : 100% malignancy risk

active space

- Radiography : Centrally placed radiolucent area at junction of metaphysis and diaphysis
  : Wisps of calcification
  ↓
  Fan like metaphyseal septation
  : Stippled / Punctate / Popcorn calcification
- Treatment : Enblock resection / Curettage + grafting

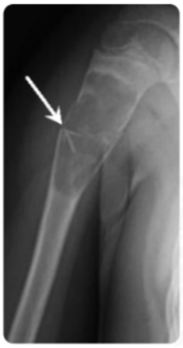
OSTEOCHONDROMA (27:12)



- Common ; developemental anomaly (Not a true tumour)
- Metaphysis → Grows with skeleton
  No growth after skeletal maturity
- Pedunculated / Sessile
  ↓
  Stalk is deviated away from growth plate / joint line
- Overlying cartilage > 2 cm : Malignant transformatio
- Usually painless, but can lead to sudden pain or complications
  ↓
  Pathological #
  Aneurysm (false)
  Bursitis
  Malignant transformation
  Nerve compression
- **Trevor's disease** : Intra-articular epiphyseal osteochondroma
- Treatment : Wait / watch
  Excision

active space

UNICAMERAL BONE CYST (34:15)



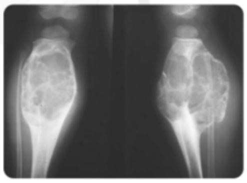
- Developemental / Reactive lesion
- first 2 decades (M > F)
- Metaphysis
- Proximal humerus > Femur (MC)
- Adults : Ilium , Calcaneum (MC sites)
- Active : Distance b/w cyst and physis < 1 cm
  Latent : ——— N ——— > 1 cm
- Most active during skeletal growth. → Heal spontaneously
- True cysts (lined by epithelium < 1 mm)
- Fluid contains PGE_2

- X-ray : Cyst is eccentric to central , Purely lytic
  Well marginated
  : Fallen fragment sign

- Aspirate : Clear serous fluid ;
  H/O trauma - Blood

- Treatment : Aspiration → Steroid
  Sclerosants
  Curettage + BG

ANEURYSMAL BONE CYST (40:40)



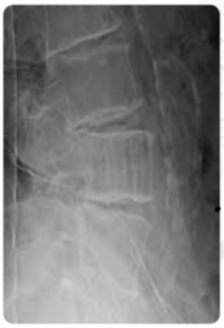
- 5-20 years
- Mild to moderate pain for weeks to months
- Locally destructive , blood filled, reactive lesion
- Not true tumours
- Proximal humerus > Distal femur
  Post. elements of spine

active space

- Gross appearence : Expansile lesion with blood filled septate spaces with thin layer of bone covered by periosteum.

- T/t : Extended curettage and grafting
  - If lesion is in large bone (Pelvis) – Pre-embolisation.

HEMANGIOMA (46:17)



- Benign lesion, incidental finding
- Vascular capillary channels (Venous or Cavernous)
- Spine > Skull > Pelvis
- Jail Bar / Corduroy appearence
- CT Section : Polka dot appearence

T/t = Symptomatic → Extended Curettage

active space

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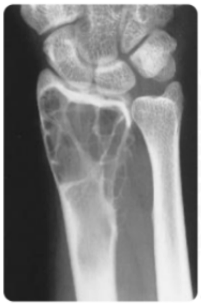
Benign Aggressive Tumours

GCT (00:20)



- 20-40 years
- Knee joint (Lower femur > Upper tibia) > Distal radius
- Clinically - Egg shell crackling (late feature)
- Sometimes, pulsatile tumour.
- Rate of malignant transformation < 5-10%

- Histology : Tumour contains :
  - Mononuclear stromal cells
  - Multinuclear giant cells

- Treatment : Curettage + BG
  (Autograft / Allograft / Artifical BG / Bone cement)

- **Management of GCT at various locations :**

i. Around knee - Hemicondylar osteoarticular allograft reconstruction OR
Rotating hinge endoprosthesis

ii. Distal radius - Primary resection and Proximal fibular allograft
(Arthrodesis / Arthroplasty)

iii. Expendable location :
Distal ulna
Proximal fibula } Primary resection
Clavicle

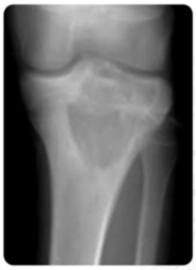
* Chemotherapy has limited success.

iv. Inoperable lesion :
Spine } Radiation
Pelvis

active space

- Sandwich technique : Bone graft b/w bone and bone cement.

CHONDROBLASTOMA (10:32)



- Also known as Codman's tumour.
- 10-25 yrs (M>F)
- Epiphysis + Epophysis (Greater trochanter)
- Distal femur > Proximal tibia
- It can cross open physis.

- X-ray : Well circumscribed lesion, central with surrounding reactive rim.
- CT-Scan for calcification → Punctate Calcification
- MRI for surrounding edema.

- Histology - Chicken wire / Picket fence calcification

GIANT CELL VARIANTS

C Chondromyxoid fibroma
C Chondroblastoma
F Fibrous dysplasia
B Brown's tumour
A ABC
N Non Ossifying Fibroma
T Telengectasia
U UBC

active space

OSTEOBLASTOMA (17:50)

- Rare bone forming tumour.
- MC presentation - Pain → Painful Scoliosis / Neurological deficit (some cases)
- Post. elements of spine
- Classical appearence : Mineralised central nidus with surrounding halo and reactive sclerosis

Nidus > 1.5 cm

- Long bones : Diaphyseal / Metaphyseal
- T/t - Extended curettage and resection

AMELOBLASTOMA (21:30)

- Epithelial tumour → Ameloblast (enamel forming cells)
- MC site - Post. part of mandible in the region of molar teeth
- Rarely metastasize
- X-ray : Honeycomb / Bubble appearence.
- Chemotherapy , Radiotherapy → No role

active space

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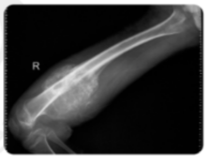
Malignant Tumours

OSTEOSARCOMA (00:10)

- Osteoid production by malignant cells.
- MC non hematological malignancy of bones.
- 2 types : 1° OS → seen in young age group
  2nd decade
  2° OS → Post Radiation/Paget's/OM, etc.



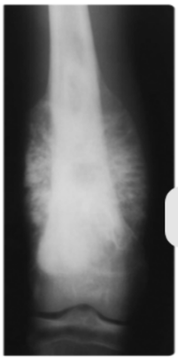
- Primary OS - **A. Conventional Intramedullary OS**
  Classical OS
  Can break cortex and present as soft tissue mass.

  B. High grade surface OS
  Least common
  Aggressive
  Arises on outer aspect of cortex

  C. Low grade Intramedullary OS
  Mimics benign lesions (FD, Osteoblastoma)

  D. Par-osteal OS
  Rare
  Low grade OS → arises from bone surface and intramedullary cavity is involved late

  E. Telangectatic OS
  On radiography → Ballooned appearence (like ABC)



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F. Periosteal OS

Arise from surface of bone - diaphysis

G. Small cell OS - Rare

- X-ray : Permeative lesion around metaphysis
  Lytic / Blastic both
  Codman's Δ / Sunburst appearence
  ↓
  due to stretching of Sharpey's fibres perpendicular to the bone

- MRI - Extent of tumour

- CT-Scan Lungs - Metacstasis

- Bone scan

- T/t - High grade lesion : Wide / Radical amputation
  Neoadjuvant Chemotherapy → Surgery → Adjuvant Chemo .

T-10 protocol

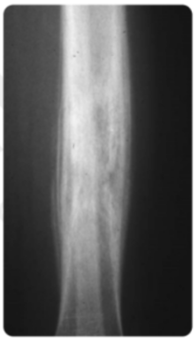
1. ABCD - Actinomycin / Bleomycin / Cyclophosphamide / Doxirubicin
2. Vincristine
3. Cisplatin
4. High dose Methotrexate

* Skip lesions can be seen.
* OS does not respond well to Radiotherapy

active space

EWING'S SARCOMA (13:20)

- 3rd MC non hematological malignancy of bone.
- 2nd MC malignancy in <30 years of age.
- MC malignancy <10 years of age



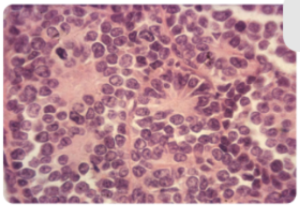
- 5-25 years ; M > F
- No skip lesions

- Metaphyseal tumour with extension into diaphysis.

- X-ray : Onion peel appearence
  Lamellated appearence
- MRI : Extent
- CT Scan, Bone scan : Metastasis

- Special points :

  - Cytogenetics : T11:22 ; Q24:12 (>90% cases)
  - Immunohistochemical staining : MIC-2 gene
  - PAS +ve and Reticulin Negative
  - Histology : Pseudorossette appearence ↓ Small, blue round cells
  - Poor prognostic factors :
    i. Distant metastasis
    ii. Fever, Anemia, ↑ WBC
    iii. ↑ ESR, ↑ LDH
    iv. Late presentation
    v. Male patient
    vi. Relapse



- T/t - Neo adjuvant / Adjuvant Chemotherapy.
  Radiotherapy → Melts like snow
  Surgery

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D/D ROUND CELLS (21:30)

- <5 yrs : Neuroblastoma
- 5-10 yrs : Eosinophilic granuloma
- 5-30 yrs : Ewing's
- >30 yrs : Lymphoma
- >50 yrs : Multiple Myeloma

CHONDROSARCOMA (23:16)

- 2nd MC non hematological malignancy of bone.
- 1° Ch. SA → 40-60 yrs
- 2° Ch. SA → 25-45 yrs
- Sites : Pelvis, Proximal femur, Proximal humerus
- May occur at sites of Enchondroma.

- MC complaint → Pain / swelling

- X-ray : Single lesion arising in medullary cavity with irregular matrix calcification.
  ↓
  Popcorn calcification
  (Punctate)

- T/t : Low grade Ch. SA → Extended Curettage
  High grade Ch. SA → Wide / Radical Resection

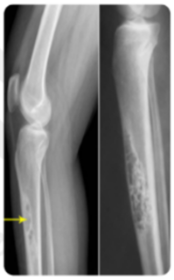
  Limited role of ChemoT. and RadioT.

active space

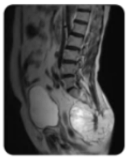
Inspired Learning

ADAMANTINOMA (27:44)

- Rare tumour
- 2^{nd}-3^{rd} decade
- Arise from epithelial cell
- Primarily seen at subcutaneous locations → Tibia
- 80-90% of patients → Tibia
- X-ray : Radiolucent densities, sharply demarcated by dense sclerotic bones.



CHORDOMA (30:06)



- 2^{nd} MC primary malignancy of spine after myeloma.
- From primitive notochord.
- Sacrococcygeal MC involved.
- T/t - wide excision

IMPORTANT POINTS (30:57)

- MC malignant bone tumour : Secondary Metastasis
- MC 1° malignant bone tumour : MM > Osteosarcoma
- MC non Hematologic malignancy : Osteosarcoma
- MC benign bone tumour : NOF > Osteochondroma
- MC true benign bone tumour : Osteoid Osteoma
- MC site of 1^{a} for bone metastasis : $\left.\begin{array}{l}\text{Prostate}\\\text{Breast}\end{array}\right] > \text{Lungs}$
- MC Blastic metastasis : Prostate > Medulloblastoma > Carcinoids

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Amputations

INDICATIONS (00:30)

• Absolute

1. Irrepairrable blood supply → diseased or injured limb.
2. Fulminant infection → Gas gangrene
3. Microvascular Ischaemia
4. Diabetic gangrene

• Relative

1. Infections
2. Burns
3. Frostbite
4. Trauma
5. Tumour
6. Nerve injury
7. Congenital anomaly
8. Contracture

6–8] uncommon

Inspired Learning

BASICS (03:30)

1. All the structures should be resected at proper level.
↓
So that a proper stump can be created.

2. Muscles should be approximately 5 cm more than the bones.
↓
So that bones can be easily covered.

3. The nerves → Hold them , pull them gently → then resect it
↓
So that nerve endings get back in soft tissue.
↓
Otherwise, there are chances of neuroma formation.

4. The muscles can be attached by:
   - i. Myodesis : Muscle attachment to bone
     Contraindicated → Vascularity is compromised (Ischaemia)
   - ii. Myoplasty : Attachment of opposite muscle groups

5. Level of amputation
   - i. Forequarter amputation : Entire upper extremity in the interval b/w scapula and chest wall is removed.
   - ii. Krukenberg amputation : For blind patients ; It converts forearm to forecep.
   - iii. Mid foot amputations : Lisfranc → TMT Joint
     Chopart → Mid - tarsal joint
     Pirogoff → Calcaneum is rotated forward to be fused with tibia, after vertical resection through middle part of calcaneum.

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iv. Hind foot amputations : Syme → Distal tibia and fibula - proximal to periphery of ankle
Sarmiento → Distal tibia and fibula - 1·3 cm proximal to ankle
Boyd → Talectomy, Forward shift of calcaneum → Calcaneotibial arthrodesis.

6. Ideal length of stump

i. Above knee → 9-10 cm distal to end of prosthetic socket
ii. Below knee → 12·5-17·5 cm (~15 cm) from medial knee joint line
iii. Above Elbow → Atleast 3·8 cm proximal to elbow
iv. Below Elbow → Depends ; Min 3·8-5 cm is preferable rather than amputation through elbow.

7. Prosthesis for foot

	SACH foot (Solid Ankle Cushion Heel)	**Jaipur foot**
Appearence	Does not look normal	looks like normal foot
Keel	Long keel, blocks movement	Small keel, allows all movement
Shoes	Requires shoes to walk	Walk barefoot
Ankle movements	**Absent**	**Present**
Cost	Costly	Cheaper

8. Complications of amputation

i. Hematoma
ii. Wound infection
iii. Wound necrosis
iv. Contractures
v. Persistent pain → Phantom limb
vi. Dermatological
vii. Sequestrum formation

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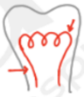
Osteomyelitis

OSTEOMYELITIS (01:00)

- Types - Acute
  Subacute
  Chronic

ACUTE OM (02:05)

- MC type of bone infection
- MC seen in children and M > F.
- Route of spread: **Hematogenous (MC)**
- **MC site: Metaphysis**
  ↓
  due to: loop arrangement of vessels
  ↓ phagocytic activity at metaphysis



- **MC organisms:**

  Overall → S. Aureus
  IV drug abusers → Pseudomonas
  Prolonged parentral therapy → Fungal
  Sickle cell Hb → Salmonella
  Human bite → Eiknella
  Animal bite → Pasteurella
  Neonates → Streptococcus Group B

- MC joint affected in young patients: Hip

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- Pathology

Infection @ metaphysis
↓
Local inflammatory response
↓
Local ischaemic necrosis of bone
↓
Abscess formation
↓
↑ in Intramedullary pressure
↓
Cortical ischaemic and breach
↓
Spread of abscess in subperiosteal space
↓
If left untreated → Formation of Sequestrum
↓
Chronic Osteomyelitis

- Clinical features :
  - Bony tenderness (localised)
  - Swelling
  - Local temperature is raised
  - High grade fever
  - Joint stiffness ; Child does not move limb due to pain (Pseudoparalysis)

- Diagnosis

i. ESR and CRP✓ → Better than ESR → Raised within 6 hours and returns to normal by end of 1st week.
↓
Peak elevation in 3-5 days and returns to normal after almost 3 weeks of starting treatment.

ii. Local aspiration → Best way to diagnose the infection

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Inspired Learning

- Culture and Sensitivity of aspirate

iii. X-ray → Initially are negative
1st to 3rd day → Soft tissue swelling
Bone changes can be seen on 10th-12th day

iv. USG → Helps in differentiating acute hematogenous OM from soft tissue conditions like Cellulitis.

v. MRI → Show changes within 24 hours → Changes in bone marrow and soft tissue
Also reveal interosseus or subperiosteal collection

vi. Bone scan → Common isotopes used:
- Technitium 99 → diagnose in 24-48 hours after onset
- Gallium
- Indium

- Treatment:
  - Antibiotics ± Surgery
  - Supportive treatment → Correct dehydration/ Splint of affected part of limb

- Complications:
  - Chronic OM
  - Pathological #
  - Acute pyogenic arthritis
  - Growth disturbances

SUBACUTE OM (29:50)

- Signs and symptoms are minimal.
- 3 probable reasons:
  - ↑ host resistance
  - ↓ bacterial virulence
  - Administration of Antibiotics before onset of symptoms.

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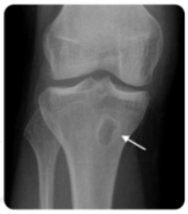
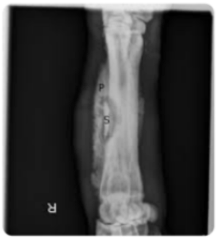
- Usual causative organisms : S. Aureus
  S. Epidermidis



- Feature : Consistent, mild to moderate pain → Only symptom
  Fever
  Systemic symptoms minimal
- X-ray : Lytic area with surrounding sclerosis
- Diagnosis - Biopsy and culture
  - Abscess may not be present but granulation tissue is present.
- T/t - Curettage
  IV antibiotics followed by oral antibiotics → 6 weeks
- Brodie's Abscess
  - Localised form of Subacute OM.
  - Usually involves long bones in lower limbs.
  - Intermittent pain will be there.
  - Usually no abscess in cavity → diagnosis is confirmed by culture of adjacent soft tissue.
  - T/t : Curettage and Antibiotics

CHRONIC OM (38:25)



- Hallmark :
  i. Sequestrum - Dead bone surrounded by granulation tissue
  - dense as compared to normal bone as there is no demineralisation.

  ii. Involucrum - Reactive new bone formation
  - Seen around sequestrum

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iii. Cloaca - Apertures in involucrum

- Causes → Can be TB, Fungal, etc.

- Clinical sign and symptom:
  - Tenderness is almost always present
  - Chronic discharging sinus → Commonest presentation
  - Bone is irregularly thickened
  - Adjacent joint can become stiff.

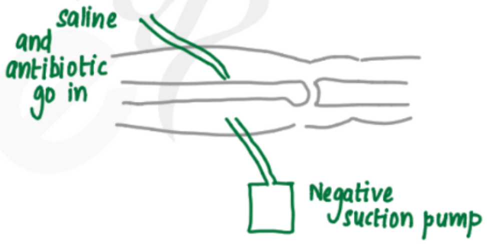
- Treatment:
  - Sequestrectomy : a window is made in bone and dead bone is removed.
    done when proper involucrum is formed else pathological # can occur.

    with ↓

  - Saucerization

    ↓

    can be supplemented with Continuous irrigation, Suction and drainage



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- Antibiotics - c/s
- Excision of bone
- Amputation

- Complications

1. Acute exacerbations - MC
2. Growth abnormalities in children. → Deformity / Shortening
3. Pathological #
4. Joint stiffness
5. Sinus tract malignancy → Squamous cell carcinoma
6. Amyloidosis (late)

GARRE'S OM (56:20)

- "Sclerosing OM of Garre"
- Non suppurative, sclerosing OM → Marked sclerosis and Cortical thickening and distension of bone
- Features:
  - Age grp: 8-10 yrs / Young adults
  - Intermittent complaints
  - Swelling and tenderness over localised area
  - ↑ ESR
  - X-ray: generalised sclerosis
  - Culture are usually negative.
- T/t: Usually, no treatment is completely helpful

active space

CHRONIC MULTIFOCAL NON SUPPURATIVE OM (01:00:00)

- Chronic non bacterial OM
- Rare, autoinflammatory disease → involves children and adolescent.
- Multifocal, recurrent lesions → Metaphysis of long bones
  - Clavicle
  - Rib cage
  - Sternoclavicular joint
- Considered equivalent of 'SAPHO' syndrome.
  ↓
  - Synovitis
  - Acne
  - Pustulosis
  - Hyperostosis
  - Osteitis
- No abscess in these lesions.
- 'Sickle cell disorder' children can have Ch. MOM.

- T/t - Palliative
  Antibiotics usually have no role.

active space

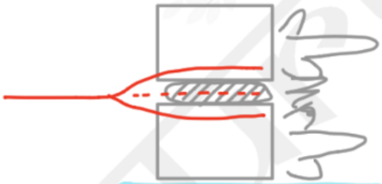
Inspired Learning

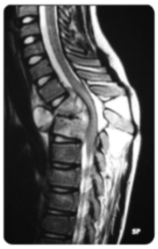
TB Osteomyelitis

- Causative organism : Mycobacterium TB
- Etiology : Always 2^0 to some 1^0 focus → Lungs / Lymph nodes
- Route of spread : Hematogenous or from surrounding tissues
- MC skeletal site affected : Vertebra : Pott's Spine

POTT'S SPINE (03:15)

- MC skeletal site - Vertebra > Hip > Knee
- Any level of spinal region can be involved ; MC - Lower thoracic > Upper Lumbar
- Type of involvement of vertebra :



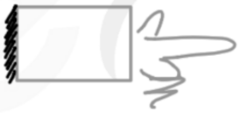


a. **Paradiscal involvement**

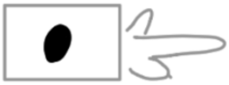
MC type of involvement

1st radiological sign seen -

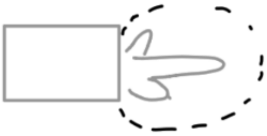
Narrowing of I.V. disc space



b. Anterior involvement



c. Central involvement



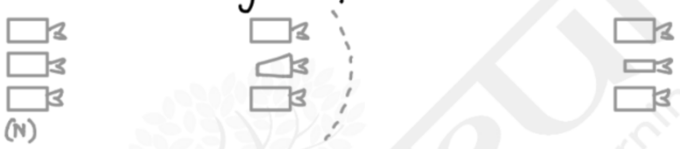
d. Posterior or Appendicial involvement

Least common

Facet > Spinous process

- Pathology : Involvement of contiguous area of adjacent vertebra leads to destruction of vertebra

- Wedge collapse
- Concentric collapse



- Abscess formed is known as '**Cold Abscess**'
  ↓
  Due to exudative reaction
  No signs of inflammation
  Composed of WBC, serum, caseous material, bone debris, TB bacilli

- Abscess formed can now travel to other sites.
  - Abscess of thoracic spine may rupture into mediastinum (**Bird's nest appearence**) or it can also reach to anterior chest wall in parasternal area through intercoastal vessels.
  - Lower dorsal or lumbar region : Abscess can go to Iliac fossa (Psoas abscess)
    Lumbar triangle
    Below Inguinal ligament
    It may go up to Knee also → If there is B/L psoas abscess it can lead to B/L hip flexion deformity
    ↓
    Pseudo hip flexion deformity

- Clinical features:
  - Active stage → Insidious onset of pain, weight loss, loss of appetite, malaise, sweating, fever
  - Features @ spine → In dorsal spine : **Kyphosis**
    Spine is stiff ; Spasm of vertebral muscles

eGURU Inspired Learning

During sleep, muscles get relaxed so they allow movement b/w inflamed surfaces → 'Night cries'

- Investigations : 1. X-ray : ↓ in I.V. disc space
  destruction of vertebra
  soft tissue shadow may be seen
  2. CT Scan : can detect small paravertebral abscesses
  3. MRI : status of compression of spinal cord
  4. Biopsy : CT guided biopsy

- Treatment : 1. ATT
  2. Rest / immobilization of affected part
  3. High protein diet, Improve anemia

POTT'S PARAPLEGIA (25:25)

Early onset paraplegia

< 2 yrs of onset of symptoms/disease

- Inflammatory edema
- TB granulation tissue
- TB abscess
- Caseous tissue

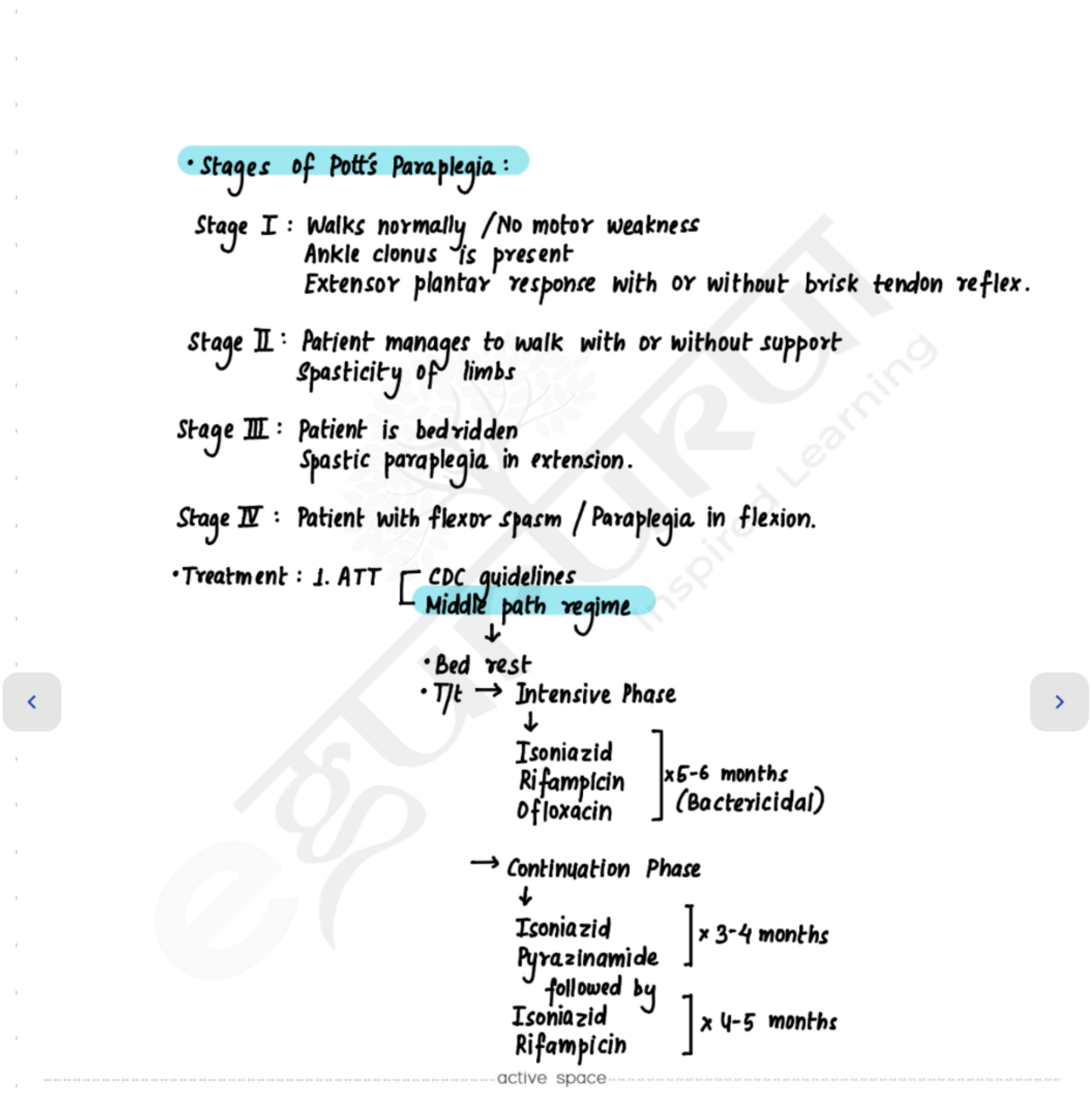
Late onset parapleg

> 2yrs of onset of symptoms

- Caseous tissue
- TB debris
- Sequestra from vertebral bodies
- deformity (gibbous)
- Canal stenosis

C/F : The paraplegia is spastic to start with and most prominent sign is clonus.
Later, becomes flaccid.

active space



• Stages of Pott's Paraplegia :

Stage I : Walks normally / No motor weakness
Ankle clonus is present
Extensor plantar response with or without brisk tendon reflex.

Stage II : Patient manages to walk with or without support
Spasticity of limbs

Stage III : Patient is bedridden
Spastic paraplegia in extension.

Stage IV : Patient with flexor spasm / Paraplegia in flexion.

• Treatment : 1. ATT [CDC guidelines
Middle path regime
↓
• Bed rest
• T/t → Intensive Phase
↓
Isoniazid
Rifampicin
Ofloxacin] x 5-6 months (Bactericidal)

→ Continuation Phase
↓
Isoniazid
Pyrazinamide] x 3-4 months
followed by
Isoniazid
Rifampicin] x 4-5 months

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→ Prophylactic phase
↓
Isoniazid] × 4-5 months
Ethambutol]

★ If patient is admitted, Streptomycin replaces one of the drugs except Isoniazid.

- **Indications for operative management:**
  - Advanced disease with marked bone destruction with threatened acute Kyphosis or Paraparesis.
  - Neurological complications not improving in 3-6 weeks.
  - For mechanical stability of spine
  - Recurrence in neural complications.

- **Surgeries that can be done** → Costotransversectomy (limited role)
  Anterior / Anterolateral decompression of spine
  Arthrodesis of spine
  Laminectomy

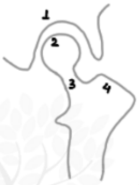
- **Prognosis of Pott's spine:**

Features	Better Prognosis	Poor Prognosis
- degree of cord involved	Partial	Complete
- duration of cord involvement	Shorter	Long (>12 months)
- Speed of onset	Slow	Rapid
- Age	Younger	Elderly
- Type	Early onset	Late onset
- General condition	Good	Poor
- Vertebral disease	Active	Healed
- Kyphotic deformity	<60°	>60°
- Cord on MRI	Normal	Myelomalacia
- **Preoperative**	**Wet TB**	**Dry TB**

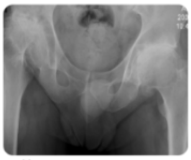
active space

TB OF HIP JOINT (54:05)

- 2nd MC skeletal site after vertebra.
- Involvement :
  MC site - Acetabulum
  Head of femur
  Neck
  GT



- **Stages of TB of Hip:**

Stage	Clinical finding	Radiological features
I. Synovitis (Effusion of joint, Hip capsule remains in position of max. capacity)	Flexion, Abduction, ER (Apparent lengthening)	· Soft tissue edema · Articular margin may become hazy Rarefiction of bones
II. Early Arthritis (Muscle spasm)	Flexion, Adduction, IR (Apparent shortening)	· Femoral head erosi @ margins/Acetabulum · Joint space is maintained · Osteopenia
III. Late Arthritis (Joint is destroyed)	Flexion, Adduction, IR (True shortening)	· Above features + ↓/loss of joint space
IV. Advanced Arthritis (Dislocation/Subluxation)	Flexion, Adduction, IR 	· Gross destruction · Wandering acetabulum

active space

Inspired Learning

* Flexion deformity of hip assessed by **Thomas test.**
* Mild Flexion deformity of hip → **Agnes Hunt traction**

- T/t · 1. ATT
  2. Rest, Physiotherapy / General care of patient

TB OF KNEE JOINT (01:08:07)

- Pathology :

Hematogenous spread
↓
Dissemination in synovium
↓
Subchondral bones
↓
Remains as TB synovitis
↓
Synovial membrane becomes congested and studded with tubercles
↓
Joint fluid ↑ → Granulation tissue
↓
Damage to articular margin ← Pannus formation
↓
Destruction of bones and ligaments

- C/F: With progression → there is gross destruction of knee and surrounding structure
  ↓
  If it remains neglected → **Spasm of hamstrings (contracture) (especially - biceps femoris)**

active space

Contracture
↓
Knee → Flexion, Posterolateral subluxation, ER and Abduction
↓
Triple deformity of knee
↓
Further ↑ in deformity is done by Tensor fascia lata through Iliotibial band contracture

TB OF OTHER JOINTS (01:15:15)

- Carries sicca - Dry TB of Shoulder
  Poor Prognosis
- Spina ventosa - TB Dactylitis

HEALING IN TB (01:17:00)

- By ankylosis
  ↓
  Pathological fusion of a joint
  ↙ Bony ↘ Fibrous

Bony	Fibrous
No movement	Movement +
Painless	Painful

Arthrodesis
↓
Done surgically

active space

Inspired Learning

Infective Arthritis

- **Pyogenic or Suppurative arthritis**
- Occurs due to bacteria invading a joint → can be due to:
    - Hematogenous spread
    - Adjacent site of Osteomyelitis
    - Directly from trauma or surgery / cellulitis

- More common in :
    - Rheumatoid arthritis
    - Seen after joint replacement surgery
    - IV drug abuse
    - Alcoholics
    - Diabetic

- **Common organisms :**

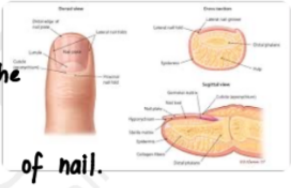
- Neonate / Rheumatoid arthritis / Hemophilia → S. Aureus
- < 2 years → H. Influenzae / S. Aureus
- > 2 years → S. Aureus
- Sexually active adults → Neisseria
- Elderly → S. Aureus / Streptococci

- Treatment : Principle - To save the joint
    - Debridement of inflamed tissue + Antibiotics + Supportive therapy

* **Tom Smith arthritis** : Septic arthritis of hip in infants

Inspired Learning

HAND INFECTIONS (08:00)



1. Paronychia → 'To run around'
   - S. Aureus
   - Infection of soft tissue fold around the fingernail

C/F - Pain/tenderness / swelling on one or both sides of nail.
can be at base of nail

T/t - Incision and drainage of abscess

- Chronic Paronychia - Occurs when nails are having long exposure to water
  Eponychium is thickened

T/t - Methyl prednisolone

2. Felon - Infection of subcutaneous tissue of distal pulp of finger.
   This occurs due to penetrating trauma to the finger.

T/t - Antibiotics and drainage of abscess.

3. Tenosynovitis of flexor tendon sheath

- Occurs due to spread of adjacent pulp infection.
- Kanavel's Sign
  - Tenderness over involved sheath
  - Rigid position of finger in flexion
  - Pain on attempting hyperextension of fingers
  - Swelling of involved part of the hand

- T/t - Antibiotics
  Splintage
  Decompression if needed.

active space

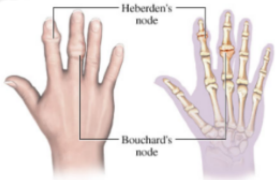
Joint Disorders

OSTEOARTHRITIS (01:10)

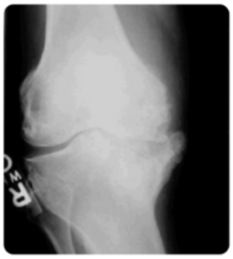
- Chronic non-inflammatory joint disorder
- MC joint affected in OA → Knee : Medial side = Genu varum
- MC muscle affected in OA → Quadriceps / Hamstring > Gastrocnemius

- Joint usually not involved in OA : Wrist
  MCP → except 1st MCP

- Hands → Nodular swellings @
  DIP : Herberden's nodes
  PIP : Bouchard's nodes



- Knee → X-rays : Asymmetrical loss of cartilage
  Sclerosis of subchondral bone
  Cystic lesions @ articular surface
  Osteophytes
  Loose bodies
  Absolute loss of joint space
  Joint destruction



- Pathology : Cardinal signs for OA
  - Progressive cartilage destruction
  - Subarticular cyst formation
  - Sclerosis of surrounding bone
  - Osteophyte formation
  - Capsular fusion

active space

- Classification → 1° → Idiopathic OA
  → 2° → Trauma
  Calcium deposition disorders
  Obesity
  Metabolic disorders → Alkaptonuria

- T/t : Ahlback's grading
  - I → Joint space < 3mm
  - II → Joint space obliteration
  - III → Bone attrition 0-5 mm
  - IV → —— " —— 5-10 mm
  - V → —— " —— >10 mm

T/t options : NSAIDs
Physiotherapy [Muscle strengthening (Quadriceps)
Heat therapies
Visco - Supplementations → Hylase / Glucosamine
Intra-articular (Arthroscopic washout)
HTO (High tibial osteotomy) ⟶ Contraindications :
- Narrowing of lateral compartment
- Lateral tibial subluxation >1cm
- Medial compartment bone loss > 2-3 mm
- Flexion contracture of Knee > 15°
- Knee flexion < 90°
- >20° correction required
- Varus deformity >15°
  Valgus deformity > 12°
- Osteochondral injury > 1/3 surface, >5 mm deep

Total knee replacement

Inspired Learning

active space

RHEUMATOID ARTHRITIS (17:00)

- Chronic autoimmune disorder
- More common in females – 30-50 years
- HLA DR4 - Risk factor

- Pathology — Synovial membrane
  ↓
  Non specific inflammation
  ↓
  T cell activation
  ↓
  Chronic inflammatory phase

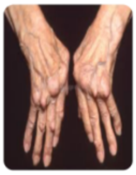
- Diagnostic Criteria

  - 1987 Criteria
  - 2010 Criteria – Joint involvement
    RF and anti CCP
    duration
    AbⓃ ESR / CRP
    ↓
    ⩾6 s/o RA

- Articular manifestations:

  - Joints not involved - DIP Joint
    Vertebra except C_1, C_2

  - Wrist : Due to carpal subluxation, there is lateral deviation of wrist and ulnar deviation of fingers
    ↳ Z- deformity



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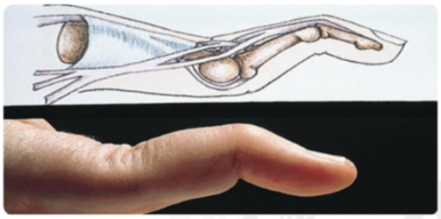
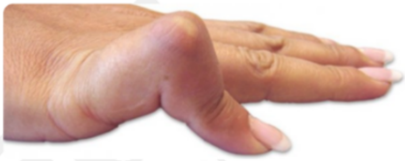
Inspired Learning

- Hand - Boutonniere
  Swan neck





- Vertebra → $C_1 C_2$ subluxation
- Knee → Triple deformity of knee
- Hallux → Hallux Rigidus / Hallux valgus

' Windswept deformity '

- Extra-articular manifestations
- Lab findings → Anemia
  ↑ ESR / CRP
  Viscosity of synovial fluid ↑
  RF - Autoantibody against Fc portion of IgG.
  Anti CCP
- Treatment : NSAIDs
  DMARDs – Methotrexate
  Biologicals
  Corticosteroids

active space

ANKYLOSING SPONDYLITIS (29:30)

- Seronegative arthropathy → Axial skeleton
- Sacro Iliac joint

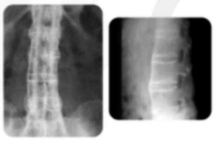
- Features : Age grp 15-25 yrs ; Males
  Enthesitis - Hallmark
  HLA B27 positive

- Diagnostic Criteria : 'Modified New York Criteria'
  - Essential criteria → Definitive sacroilitis
  - Supportive criteria → H/O inflammatory bachache
    limited chest expansion <5 cm @ 4th ICS
    limited lumbar movement (Schober's test)

- Clinical tests :- Schober's test
  - Gaenslen's test } S-I joint
  - Pump handle test }

- Investigation → Anemia / ↑ESR / ↑CRP
  HLA B27

- Radiographic →



A. Spine :- Loss of curvature
- Sclerosis of anterior corner of vertebral body
  'Squaring of vertebra'
- Bamboo spine appearence

B. S-I joint : - Haziness of SI joint
- Obliteration of SI joint
- Loss of lumbar Lordosis
- Syndesmophyte and paravertebral ossification

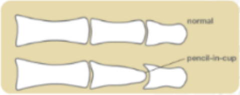
active space

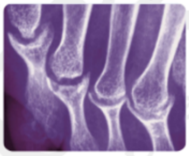
★ MRI - SI (Intraarticular) inflammation

- Treatment - NSAIDs and physical therapy
  For refractory cases - Phenylbutazone (Aplastic anemia)
  Anti TNF-α

PSORIATIC ARTHRITIS (39:25)

- Absorption of phalanges - Pencil in Cup appearence





NEUROPATHIC JOINT (40:12)

- Progressive arthritis → destruction of joint
- Causes - Diabetes : Intertarsal joints
  Tabes dorsalis : Knee
  Leprosy : IP joints of hand

HEMOPHILIC ARTHROPATHY (41:50)

- Factor VIII/IX deficiency
- MC presentation - Swelling of knee
  - Iliopsoas > Quadriceps
- Aspiration & Arthroscopy - Relative contraindications
- Deformity - Triple deformity of knee

active space

GOUT

- Occurs due to deposition of uric acid crystals.
- Small joints → 1st MTP
- C/F → Pain/Swelling – Intense
- Aspiration
  - ↳ Needle/Rod shaped crystals
  - ↳ MSU crystals
  - ↳ Negatively birefringent
- Acute case : NSAIDs / Colchicine
  Chronic : Allopurinol

PSEUDOGOUT

- CPPD crystals
- Knee
- Swelling
- Rectangular shaped crystals
  - ↳ CPPD crystals
  - ↳ Positive birefringent
- Aspiration and compression bandaging

LOOSE BODIES IN KNEE JOINT (48:20)

- MC cause - Osteoarthritis (Elderly)
  Osteochondritis dissecans (Young)

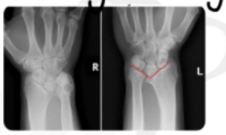
active space

Basic Terminology & Coxa Vara

PEDIATRIC ORTHOPAEDICS (00:10)

Terminologies :

1. Melia - Limb
2. Amelia - Abscence of limb
3. Hemimelia - One of the two paired bones is absent
   - ↳ Radial/ulnar
   - ↳ Tibial/ Fibular
4. Phacomelia - Seal like limb
5. Syndactyly - Conjoined digits → Commonest congenital malformation
6. Synostosis - Failure of embryological seperation of skeletal components.
7. Camptodactyly - Bent fingers : Flexion of PIP joint usually of little finger
8. Duplication of digits : Polydactyly - Extra digits
   - Macrodactyly - Overgrowth
   - Brachydactyly - Under growth
9. Madelung's deformity - The distal radius from medial aspect, it fails to develop and the ulna subluxates dorsally



10. MC muscle associated with congenital abscence - Pectoralis
11. Pseudoarthrosis - Causes → Congenital : MC bone → Tibia
    - Idiopathic : MC cause
    - Non - union
    - Post surgical
    - Neurofibromatosis

active space

- T/t : Excision + Bone grafting + Fixation

PEDIATRIC HIP PROBLEMS (12:45)

- Pediatric Hip Calender :

At birth	CDH
2-5 yrs	Septic arthritis (Tom Smith Arthritis)
4-8 yrs	Perthe's disease
5-12 yrs	Transient synovitis
10-15 yrs	SCFE (Slipped Capital Femoral Epiphysis)

- Causes for limp :

Painless	Painful
• CDH /DDH	• Perthe's
• Congenital coxa vara	• SCFE
• Limb length discrepancy	• TB Synovitis Septic arthritis

COXA VARA (17:30)

- Neck shaft angle < 120°
- Classification for Coxa Vara :

Congenital	Acquired
Congenital femoral deficiency	SCFE
Developemental ↳ Skeletal dysplasia Eg. Cleidocranialdysostosis	Perthe's
	# NOF
	Traumatic hip of CDH
	Osteogenesis imperfecta
	Fibrous dysplasia , Osteopetrosis

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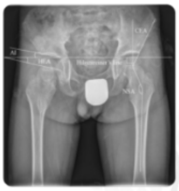
- C/F : Pain
  Shortening < 3 cm
  Limitation of Abduction and IR

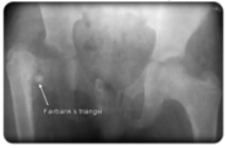
- X-ray :



- Hilgenreiner - Epiphyseal angle
  (N) ≯ 30°

- T/t : HE angle > 40°, < 60° - Observe
  > 60° or if shortening is progressive — Subtrochanteric Valgus Osteotomy

* Fairbank Δ - Seperate triangle of bone seen at inferomedial part of metaphysis.



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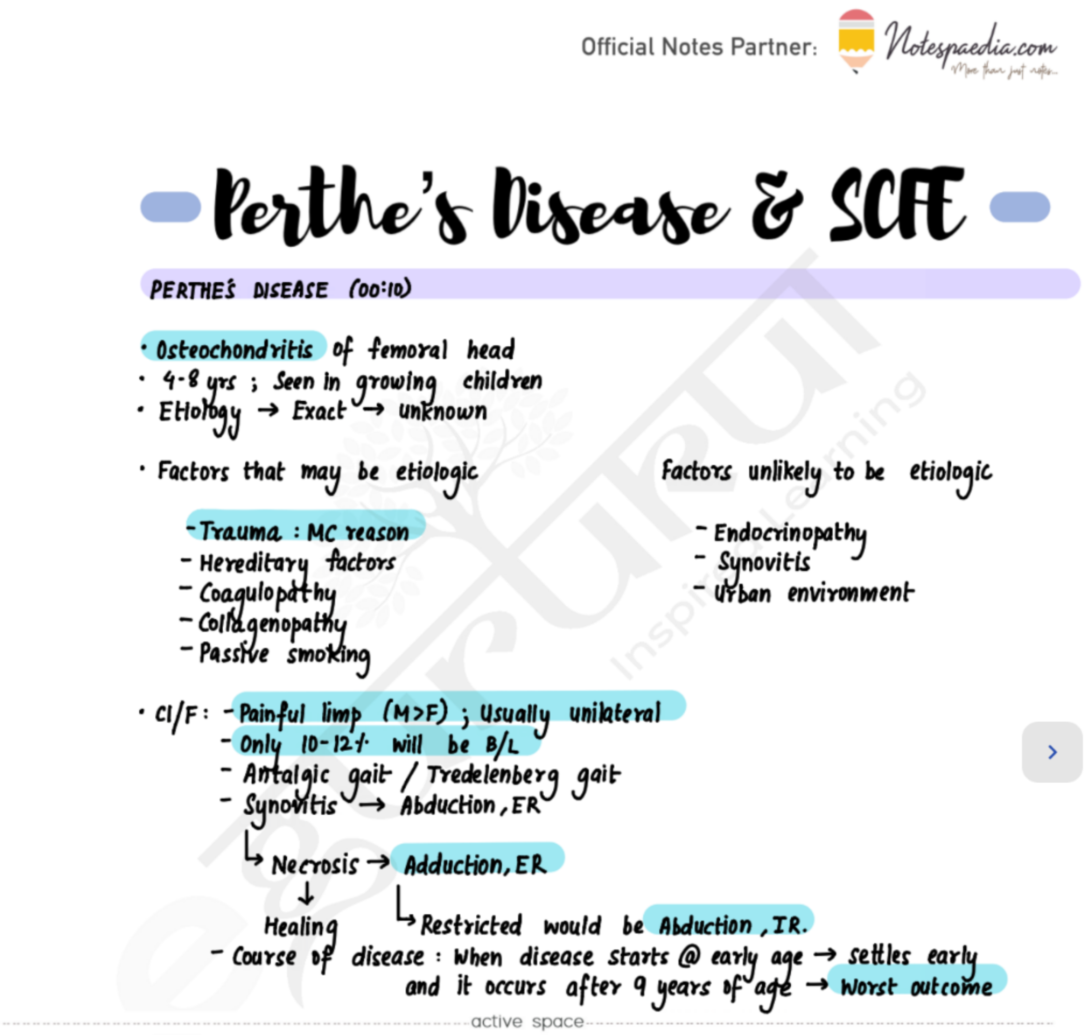

Perthe's Disease & SCFE

PERTHES DISEASE (00:10)

- Osteochondritis of femoral head
- 4-8 yrs ; Seen in growing children
- Etiology → Exact → unknown
- Factors that may be etiologic
  - Trauma : MC reason
  - Hereditary factors
  - Coagulopathy
  - Collagenopathy
  - Passive smoking

Factors unlikely to be etiologic
- Endocrinopathy
- Synovitis
- Urban environment

- Cl/F :
  - Painful limp (M>F) ; Usually unilateral
  - Only 10-12% will be B/L
  - Antalgic gait / Tredelenberg gait
  - Synovitis → Abduction, ER
    - ↳ Necrosis → Adduction, ER
      - ↓ Healing
      - ↳ Restricted would be Abduction, IR.
  - Course of disease : When disease starts @ early age → settles early and it occurs after 9 years of age → Worst outcome

Inspiring Learning

- Radiographic finding and staging :

Stage	Clinical finding	Radiography
a. ↑ density stage	Limp ; Pain variable Mild to intermittent	↑ density of femoral head without any subchondral #
b. Fragmentation stage	Worsening of pain and limp.	Head shows fragmentation May show lateralization
c. Reossification stage	Pain/limp start resolving	Femoral head gradually ossifies Flattening may improve
d. Healed stage	Occassional limp	Osteochondral lesions

- X-Rays : Catterall
Salter Thompson
Lateral Pillar Classification → A. No loss of height
B. >50% ↓ in height
C. Height <50%

* May show : 'Sagging Rope sign'

Rope like radiodense line along the Intertrochanteric line.
Represents edge of enlarged femoral head → Coxa Magna

(b) MRI - Most accurate investigation for Perthe's
(c) Scintigraphy - Tc scan is highly sensitive.
(d) Arthrography - Not commonly done
(e) USG - Can be done in initial stages for joint effusion.
(f) CT - Not routinely used

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- Treatment : Main aim → Containment of femoral head in acetabulum
  - → Non-surgical → Braces : Petrie Brace
    Scottish Rite Brace
  - → Surgical → Osteotomy

SLIPPED CAPITAL FEMORAL EPIPHYSIS (21:25)

- Epiphysis doesn't slip.
- When during a phase of rapid developement of bones, there is ↑ stress d/t ↑ weight and there is anterior and upward movement of femoral neck on epiphysis.
- Epiphysis remains posteromedial.
- Male > Female

- Classification :

  - Acute SCFE : Prodromal symptoms for ≤ 3 weeks presents with sudden fractu
    like episode after minor trauma.
    Salter Harris Type I injuries

  - Chronic SCFE : Most frequent form ; Adolescent patient presenting with vague groin pain

  - Acute on Chronic SCFE : Prodromal symptoms > 3 week ; Sudden onset pain (exacerbation)

- Etiology : In majority → Remains unknown

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Mechanical factors

- Thinning of perichondrial ring complex.
- Retroversion of femoral neck
- Change in inclination of adolescent proximal physis in relation to neck and shaft.

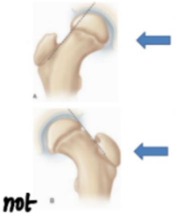
Endocrinal factors

- Imbalances - Thyroid growth
  Sex hormone
- Chronic renal failure
- Kleinfelter syndrome
- Turner syndrome
- 1° Hypoparathyroidism

Genetic

- Cl/F : Adolescent overweight child
  10-15 years
  Antalgic gait / Trendelenburg gait
  Obligatory ER : Sectoral necrosis
  On flexion → Hip goes in ER
  Also seen in Perthe's disease , AVN

- X-Ray : Klein's line → A line drawn parallel to superior femoral neck.
  Normal line
  Trethovan's sign → If not intersected



Normal hip. A line drawn parallel to the superior femoral neck (Klein's line) will intersect the lateralmost portion of the capital femoral epiphysis

Trethowan's sign

- CT Scan : Not usually neccessary
- Tc 99 Scan : ↑ uptake in capital femoral epiphysis
- USG : Detection of early slip, effusion is there or not
- MRI : Early SCFE can be diagnosed
- Treatment : Definitive Tt → Fixation → If this fixation is done → can ↑ chances of AVN

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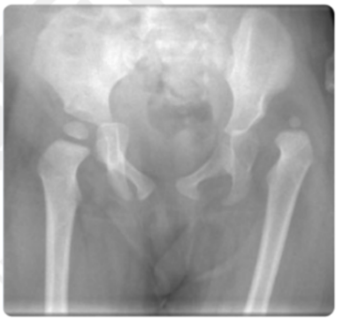
CDH & Blount's Disease

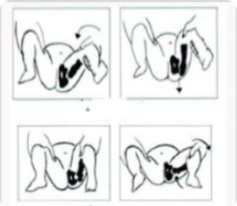
DDH (00:10)



- CDH - Congenital dislocation of hip
  DDH - Developemental dysplasia of hip

- Etiology - Proposed factors:
  - Ligamentous laxity of hip capsule (F>M)
  - Prenatal positioning - Breech
  - Postnatal posturing
  - Primary acetabular dysplasia
  - More in Western countries > Asian

  - Risk factors:
    - Family H/O DDH
    - Breech presentation
    - Female
    - First born White
    - Oligohydroamnios / Torticollis / Metatarsus adductus



- Cl/F: a. Neonate → i. Barlow test: Adduct hips and give a gentle push
  → It will dislocate hip
  Most provocative test
  ii. Ortolani: Abduct + Pull
  iii. Alli's test / Galeazzi sign: Compare the positions of knees

  b. Infant: If the hip is not reducible → limited abduction - Most reliable sign of dislocated hip.
  Shortening (Galeazzi sign)
  Asymmetry of thigh folds

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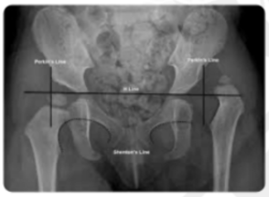
c. Walking : Toe walk
Abductor lurch / Tredelenburg sign +ve
due to hip flexion (↑ Lordosis)

- Investigations

i. X-ray : Perkin's line
Hilgenreiner's line] Head should be in inferior inner Quadrant
↓
If not present → Head is dislocated



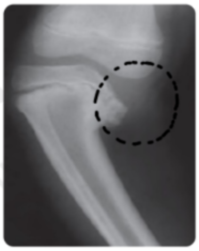
ii. USG - Investigation of Choice for Screening
iii. MRI - IOC for diagnosis

- Treatment :

Age	Tt
1-6 months	Pavlik harness
6-18 months	Traction with CR $\xrightarrow{(+)}$ Cast × 3 months ↓(-) Open Reduction
8-24 months	Attempt for CR/OR → Osteotomy, usually not needed
24 months	Osteotomy or OR ± Femoral shortening

BLOUNT'S DISEASE (16:45)

- Tibia varu : Growth retardation on proximal tibia through (Genu varum) medial aspect.
  - Infantile <3 year → Blount's disease
  - Late Onset
    - Juvenile 4-10 yrs
    - Adolescent >10 yrs



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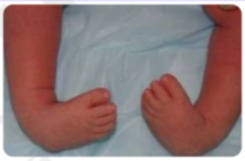
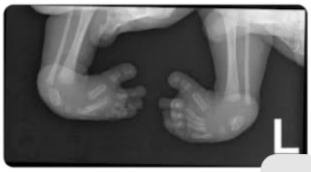
CTEV & Achondroplasia

CONGENITAL TALIPUS EQUINUS VARUS (00:10)



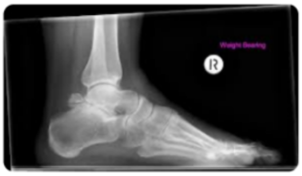
- Tali = Talus
  Pes = Foot
- 1-2 : 1000 live births
- Etiology
  - Idiopathic [1° CTEV]
  - Syndromic [Atypical CTEV]



- Deformities :

i. Cavus - High arched foot
ii. Adduction - Occurs at forefoot
  1° joint - TaloNavicular joint
iii. Varus - Calcaneum
iv. Equinus - ↑ in Plantar flexion
  (Ankle joint → TibioTalar joint)

Inversion : TaloCalcaneal joint (SubTalar joint)



- X-ray :- Talocalcaneal Angle (Normal) → KITE'S ANGLE
  - AP view : 30° - 55°
  - Lateral view : 25° - 50°
  - In CTEV ≈ 0° (Varus)

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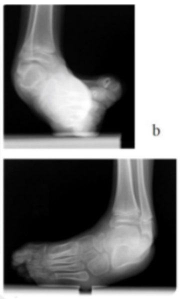
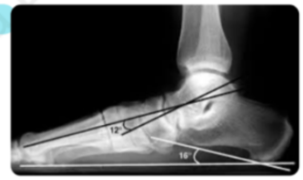
- Tibia / Calcaneum : 10°-40°

  ↑ in angle = s/o Equinus

- Talus - 1st MT : 5°-15° (AP view)
  Turns negative
  ↓
  Adduction deformity



- Talus - 1st MT (Lateral view) - MEARY ANGLE
  Normal = 0°
  If angle > 4° → Pes Cavus
  - Negative → Pes Planus
  Convexity downwards



- Treatment
  - Started preferably in 1st week of life.
  - PONSETI TECHNIQUE
  - Order of Correction : CAVE
    Cavus > Adduction > Varus > Equinus
    ↳ All deformities are corrected simultaneously
  - Normally 6-7 plaster are enough / Not >10 plaster
    ↳ Changed every 5-7 days
  - Equinus is always last to be corrected → Tenotomy of Tendoachilles may be required
    ↓
    Once correction is achieved
    ↓
    DB splint
    Slight valgus and 70° abduction
    ↓
    Overcorrected position

- When the child starts walking, if needed
  ↓
  CTEV shoes : Lateral margin → Raised → Inversion
  Medial margin → Straight
  No heel → Equinus

- If Neglected / Relapse :

  If age < 4 years : PMSTR
  If age > 4 years : PMSTR + Bony Corrections
  ↓
  < 8 years : Calcaneocuboid fusion (Dwyer's Osteotomy)
  > 8 years : Wedge Tarsectomy
  > 10 years : Triple Arthrodesis → Talo Calcaneal
  Talo Navicular
  Calcaneo Cuboid

ACHONDROPLASIA (18:22)

- MC form of dwarfism
- AD disorder

- Pathophysiology : Failure of enchondral ossification (Bones remain short)
  (Intramembranous and Periosteal ossification is normal)

- Clinical features :
  - Short stature → IU life : length of femur
  - Trunk height is (N)
  - Arm span and Height → Reduced
  - Rhizomelic shortening : Shortening is more in proximal bones
  - Mental and sexual developement is (N)
  - Hands are short / broad → Central 3 fingers may be of equal length
    Star fish hand appearence
    → Trident hand appearence

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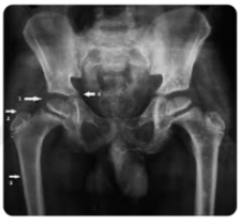
- Radiography : Champagne glass appearence
  Scalloping of vertebra / Bullet shaped Vertebra



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Soft Tissue Conditions

FROZEN SHOULDER (01:00)

- Adhesive capsulitis / Periarthritis of shoulder.
- 1-1½ years
- 1st movement lost : IR of shoulder > Abduction

PAINFUL ARC SYNDROME (04:05)

- Pain during mid range of abduction → 60°-120°
- Causes : i. Supraspinatous
  - Tendonitis
  - Calcification
  - Partial tear

  ii. Subacromial bursitis

  iii. # Greater tuberosity

TENNIS ELBOW (06:40)

- Lateral epicondylitis - Common extensor origin
- Main tendon involved - ECRB
- Clinical test - COZEN test

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GOLFER'S ELBOW (08:40)

- Medial epicondylitis : Mainly affected - FCR and Pronator teres
- Pain ↑ses on wrist flexion and resisted forearm pronation.

BASEBALL / PITCHER'S ELBOW (10:40)

- Hypertrophy of the lower humerus , Loose bodies / Arthritic changes
- Little Leaguer's elbow : Partial avulsion of median epicondyle.

JAVELIN THROWER'S ELBOW (12:30)

- Overarm action causing avulsion of olecrenon.
- Medial collateral ligament and ulnar nerve can be involved.

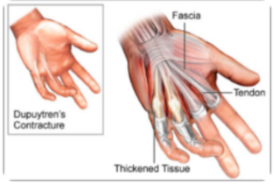
TRIGGER FINGER / THUMB (14:20)

- Stenosing tenosynovitis → A1 Pulley

DEQUERVAIN'S TENOSYNOVITIS (16:25)

- Inflammation of APL and EPB
- FINKLESTEIN Test.

DUPUYTREN'S CONTRACTURE (17:38)



- Contracture of fascia (Palmar / Plantar)
- MC involved : Ring finger > Little finger
- MC seen in Males, Alcoholics, Smokers, TB, Anti epileptics

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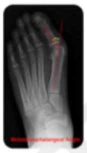
- MC presentation - Nodular swelling
  @ Palm - Garrod's Pads
  Sole - Ledder Hose disease
- Treatment : Regional / Subtotal fasciotomy
  Amputation

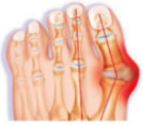
BURSITIS (21:20)

- Student's elbow - Olecrenon bursitis
- Housemaid's knee - Pre patellar bursitis
- Clergyman's knee - Infra patellar bursitis
- Weaver's bottom - Ischial tuberosity bursitis
- Tailor's ankle - Lateral side of ankle
- Bunion - Medial aspect of great toe

HALLUX VALGUS (23:50)

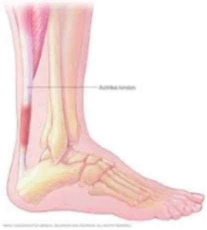


- Lateral deviation of great toe.



ACHILLES TENDONITIS (24:50)

- Overuse
- Haglund's deformity



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Inspired Learning

Complications in Orthopaedics

COMPLICATIONS RELATED TO FRACTURES (01:00)

A. Immediate Complications
- → Local : Injury to major vessel
  - Injury to muscle/tendon
  - Injury to joint
- → Systemic : Hypovolumic Shock
  - (M.C associated with # of long bones)
  - Pelvis

B. Early complications
- → Local : Infections
  - Volkman's Ischaemia
  - Compartment syndrome
- → Systemic : Hypovolumic Shock
  - ARDS
  - Crush Syndrome
  - Fat embolism syndrome
  - DVT and Pulmonary Embolism

C. Late complications → Delayed union / Malunion / Synostrosis (Cross union)
- Avascular Necrosis
- Stiffness of Joints
- Sudeak's dystrophy
- Osteomyelitis
- Myositis ossificans
- Osteoarthritis of joints

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FAT EMBOLISM SYNDROME (07:45)

- Usually seen on 2nd-3rd day after # of long bones.
- Causes :

Related to Injury

- Soft tissue injuries (Chest compression ± Rib #)
- Burns
- Liposuction
- Bone marrow harvesting and transplant

Without Injury

- Pancreatitis
- Diabetes mellitus
- Osteomyelitis
- Sickle cell Hb
- Alcoholic liver disease

- Source of fat is the marrow of long bones.

- GURD's criteria → 1 major + 4 minor

Major :
- Axillary or subconjuctival petechiae
- Hypoxemia $(PaO_2 \downarrow)$
- Pulmonary edema
- CNS involvement disproportionate to hypoxemia

Minor:
- Tachycardia
- Fever
- Retinal fat emboli
- Fat globules in urine
- Sudden ↓ in hematocrit like platelet
- Fat globules in sputum

- X-Ray : Normal initially, but in some patients B/L fluffy shadows develop as respiratory insufficiency worsens. – This has been described as Snow Storm apperence.

- CT chest : Focal areas of ground glass opacification with interlobular septal thickening.
  Ill defined subpleural nodules s/o
  Alveolar edema / Micro-hemorrhage and inflammatory response.

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- Treatment

Medical

- Adequate O_2 and Ventilation
- Hemodynamic stability (Blood, Hydration, Prophylaxis for DVT)
- Use of corticosteroids (Anti inflammatory agents, ↓ Perivascular hemorrhage)
- Heparin: stimulates Lipase activity

Surgical

- Early fixation of #
- Limit the procedure which can ↑se chance of fat embolism.

CRUSH SYNDROME (23:20)

- Injury to muscle leads to formation of toxic metabolite → Myoglobin

Myoglobin ↓ enters blood → Myohemoglobin → Reperfusion injury

↓

d/t Reactive O_2 metabolite

↓

Further tissue injury → Promotes membrane damage and capillary fluid reabsorption failure resulting in swelling

↓

Promotes Compartment Syndrome

- The free myoglobin → Renal failure → ATN/ARF
- Myonecrosis → Cause metabolic acidosis + Hyperkalemia and Hypocalcemia.
- Treatment :
  - i. Prevention
  - ii. Maintain high urine output with alkalisation of urine with Sodium Bicarbonate (Prevents the precipitation of Myoglobin)
  - iii. If Oliguria / Renal failure – Renal Hemofilteration
  - iv. Fasciotomy for Compartment Syndrome

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COMPARTMENT SYNDROME (30:50)

- When pressure in a closed osteofascial compartment is ↑sing > 30 mm → considered a raised pressure.
- MC conditions associated with CS are:
  - MC : # Tibia diaphysis
    : Soft tissue injury
    : # distal radius
    : Crush syndrome
    : # forearm diaphysis
    : # Shaft of femur

- MC symptom : Pain
- MC sign : Pain on passive movement
- MC muscle involved : FDP

- Treatment : Limb elevation with POP removal
  Fasciotomy is done on urgent basis

NON-UNION (36:30)

- Common sites : # NOF
  # Lateral condyle of humerus
  Scaphoid
  Lower 1/3rd of tibia
  Lower 1/3rd of ulna

- C/F : Abnormal movement at # site / Pseudoarthrosis

	Hypertrophic	and	Atrophic
	Callus (+)		No callus
Tt :	Proper fixation only		Proper fixation Bone grafting

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* Ideal site for Bone graft : Iliac crest
—— " —— Cortical graft : Fibula

OSTEOCHONDRITIS (40:30)

i. Scaphoid - Preiser's disease
ii. Lunate - Keinbock's
iii. Capitellum - Panner's
iv. Vertebra - Scheurmann's disease
v. Head of femur - Perthe's disease
vi. Medial aspect of lateral femoral condyle - Osteochondritis dissicans
✓ vii. Lower pole of patella - Sinding Larsen Johnson syndrome
✓ viii. Tibial tuberosity - Osgood Schlaterd's disease
✓ ix. Calcaneum - Sever's disease
x. Navicular - Kohler's disease
Metatarsals : 2nd MT head - Freiberg disease
✓ 5th MT base - Iselin injury

✓ Tractional Osteochondritis

MYOSITIS OSSIFICANS (46:00)

- MC joint → Elbow > Hip
- Can cause obstruction of joint movements
- Histologically → Resembles Osteosarcoma
  In MO : Mature cells @ Periphery
  Immature cells @ center
  Reverse of OS.

- X-Ray : Initially Negative; By 4th - 10th week : Cotton wool appearence

- Tt : i. If acute phase → limit movements
  ii. Gradually active exercises are promoted
  Passive exercise is contraindicated.
  iii. Avoid surgery till possible.

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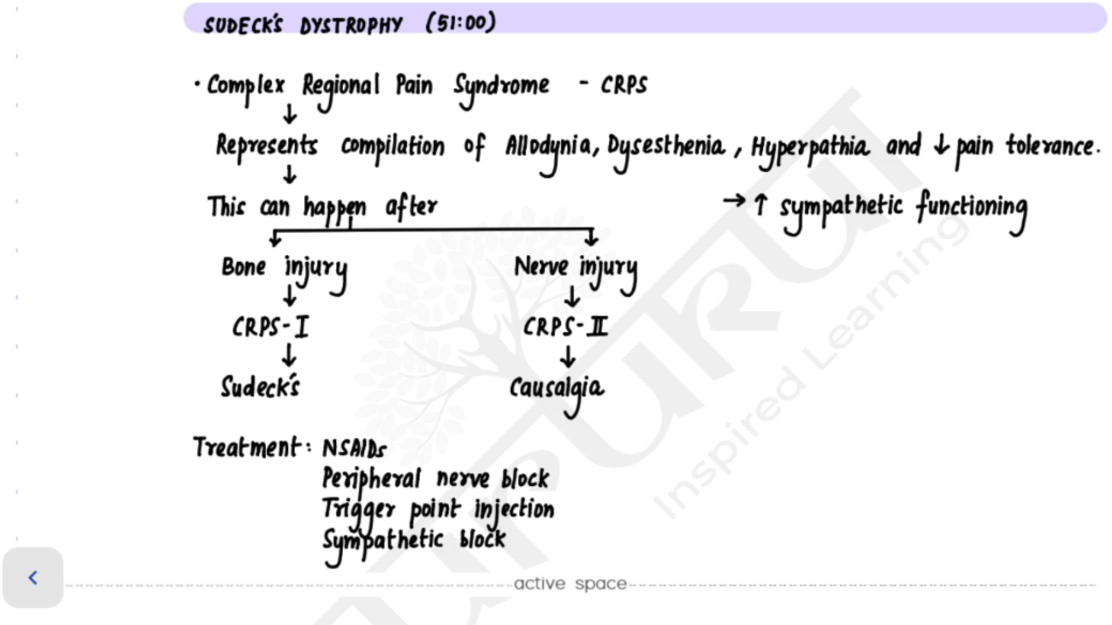

SUDECK'S DYSTROPHY (51:00)

- Complex Regional Pain Syndrome - CRPS
  ↓
  Represents compilation of Allodynia, Dysesthenia, Hyperpathia and ↓ pain tolerance.
  ↓
  This can happen after → ↑ sympathetic functioning

Bone injury → CRPS-I → Sudeck's

Nerve injury → CRPS-II → Causalgia

Treatment: NSAIDs
Peripheral nerve block
Trigger point injection
Sympathetic block

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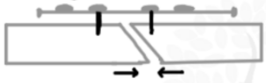
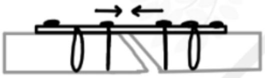
Instruments & Implants

DCP / LCDCP (00:30)

- DCP - Dynamic Compression Plate



- LCDCP - Low / Limited Contact DCP
  No extra periosteal damage



LC DCP

Unique shaped undersurface makes limited contact with bone and thus preserves blood supply

i. Reduction of # : Bone holding forceps
↓
Plate holding forceps → Hole (drill bit) → Depth gauge
↓
TAP
↓
Screw is placed

LOCKING PLATE (08:25)

- Good for osteoporotic patients

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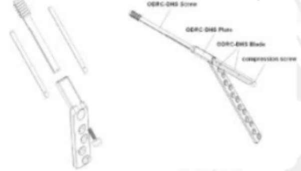
COMBINED PLATES (10:40)

DYNAMIC HIP SCREW (11:00)



- Richard screw
- # Intertrochanteric
  Basicervical NOF (Pediatric DHS)

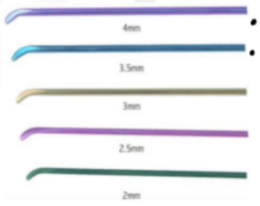
INTRAMEDULLARY NAILS (11:56)

- IOC for # of weight bearing long bones

Implant of choice

- Rigid nails - skeletally mature

TENS NAILS (12:58)



- Titanium Elastic Nailing System
- used in children for # shaft of long bones

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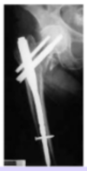
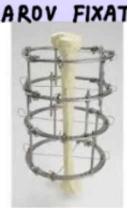
PROXIMAL FEMORAL NAIL (13:50)

- # IT



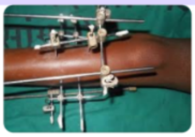
ILIZAROV FIXATOR (15:00)



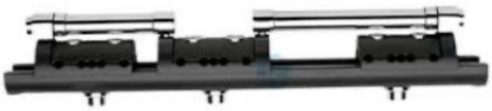
- External fixator

JESS FIXATOR (16:00)

- Joshi's External Stabilization System



LIMB RECONSTRUCTION SYSTEM (16:48)



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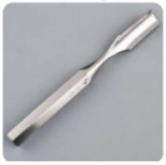
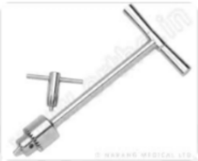
INSTRUMENTS (18:00)

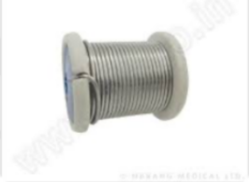
Bone gouge



T-Handle with Key



SS wire



Screw Driver

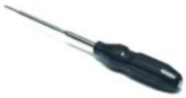


Plate Bender

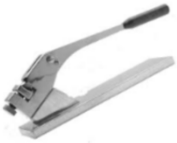
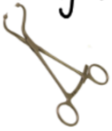
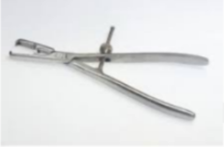


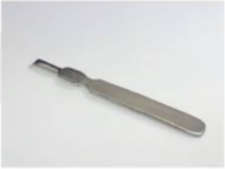
Plate Holding forcep



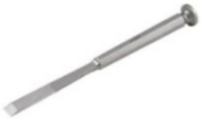
Bone Holding forcep



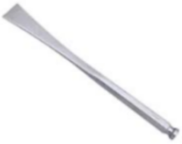
Periosteum elevator



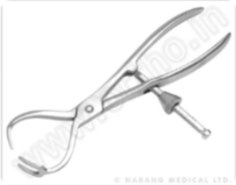
Chiesel



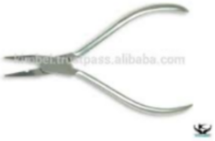
Osteotome



Patella holding

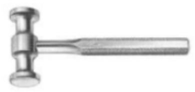


Plier

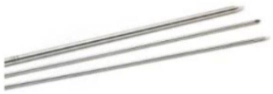


active space

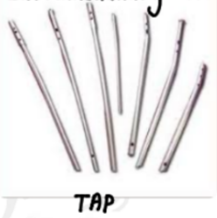
Mallet



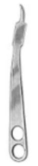
K- wires



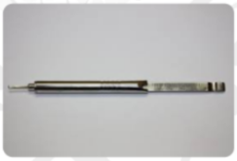
Intramedullary nails



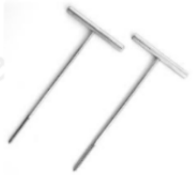
Hohman's elevator



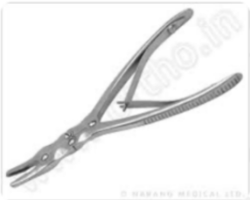
Depth gouge



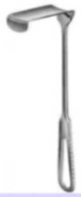
TAP



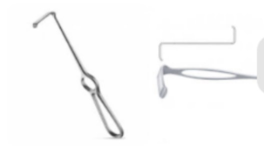
Nibbler



Morris Retractor



Langenbeck and Czerny



COMMONLY ASKED SPLINTS (27:20)

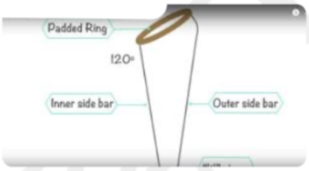
- ✓ Thomas Splint - # Femur
- ✓ Dennis Brown Splint - CTEV
- ✓ Mermaid Splint - Rickets
- ✓ Cockup Splint - Radial nerve palsy
- ✓ Knuckle Bender Splint - Ulnar nerve palsy
- ✓ Aeroplane Splint - Brachial plexus injury
- ✓ Taylor's - DL immobilization
- ✓ Milwaukee Brace - Scoliosis

active space

COMMONLY ASKED TRACTIONS (28:00)

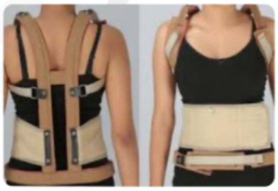
- ✓Gallow's traction : # Shaft of femur in children below 2 years
- Bryant's traction :
- ✓Russell's traction : Trochanteric fractures
- Buck's traction : Conventional skin traction
- Perkin's traction : # Shaft femur in adults
  # Shaft of femur in children
- 90°90° traction : # Shaft of femur in children / # Subtrochanteric femur
- ✓Agnes Hunt traction : Correction of hip deformity - Fixed flexion deformity
- Well leg traction : Correction of adduction or abduction deformity
- Dunlop traction : Supracondylar # of humerus
- Smith's traction : Supracondylar # of humerus
- Crutchfield traction: Cervical Spine injuries

THOMAS SPLINT (28:30)

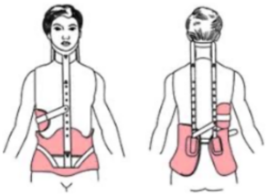


- H.O Thomas

TAYLOR'S BRACE (30:00)



MILWAUKEE BRACE



active space

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Movements Around Joints

SHOULDER

- Abduction/Adduction
- Flexion/Extension
- ER/IR
- Terminal IR ⟶ Subscapularis (Lift off test)

HIP

- Abduction / Adduction
- Flexion / Extension / Hyperextension
- ER / IR

KNEE

- Flexion /Extension

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